United States Court of Appeals

for the Second Circuit

APPENDIX

76-7414

IN THE

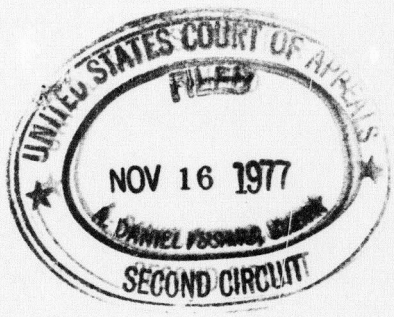
United States Court of Appeals

FOR THE SECOND CIRCUIT

BRUNSWICK CORPORATION AND
SHERWOOD MEDICAL INDUSTRIES, INC.
Counterdefendants-Appellees

v.

DAVID S. SHERIDAN AND
NATIONAL CATHETER CORPORATION
Counterclaimants-Appellants.



On Appeal From the United States District Court
For the Northern District of New York

JOINT APPENDIX
VOLUME II

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A G R E E M E N T

The holders of Common Stock of Sheridan Catheter and Instrument Corp. named in "Exhibit A" attached hereto (hereinafter referred to as "SHAREHOLDERS") and The Brunswick-Balke-Collender Company, a Delaware Corporation (hereinafter referred to as "BRUNSWICK") in consideration of One Dollar and other good and valuable consideration, and in consideration of the mutual undertakings contained herein, agree as follows, this 18th day of February, 1960:

DEFINITIONS

1. In addition to the terms, "SHAREHOLDERS" and "BRUNSWICK" defined above, the following terms shall have the meanings set forth herein for the purposes of this transaction:

1.1 "Agreement shall mean the Agreement between the parties hereto as evidenced herein;

1.2 "Contract Date" means the 18th day of February, 1960.

1.3 "Audit Date" means the date as of which the books and records of Catheter are to be audited pursuant to Paragraph 8 and unless changed by mutual agreement shall be January 31, 1960.

1.4 "Closing Date" means February 26, 1960, or such other date as the parties may agree upon in writing.

1.5 "Catheter" means Sheridan Catheter and Instrument Corp., a New York corporation.

1.6 "Catheter Common Stock" means the 260 shares of outstanding common stock of Catheter described in subparagraph 2.1;

1.7 "Brunswick Common Stock" shall mean the no par value, voting Common Stock of Brunswick deliverable pursuant to this Agreement.

1.8 "Adjusted Net Worth" has the meaning ascribed to it by Paragraph 8.

REPRESENTATIONS OF SHAREHOLDERS

2. SHAREHOLDERS, jointly and severally, represent and warrant to BRUNSWICK as follows:

2.1 that Catheter is, and will be at the Closing Date, a corporation duly incorporated and validly existing in good standing under the laws of the State of New York with the power and authority to carry on the business in which it is engaged and to own the property owned by it and having an authorized capitalization consisting solely of 500 shares of Common Stock, of no par value of which 260 shares are issued and outstanding;

2.2 that there are not now, and will not be at the Closing Date, any outstanding options to purchase or subscriptions to shares of Catheter Common Stock;

2.3 that the balance sheet of Catheter as of November 30, 1959, certified by David S. Sheridan, attached hereto and marked "Exhibit B" is complete and fairly reflects the financial condition including contingent liabilities of Catheter as of November 30, 1959.

2.4 that there have been no material changes in the financial condition of Catheter since the balance sheet as of November 30, 1959, other than those occuring in the usual, regular and ordinary course of business or referred to in this Agreement and that there is no litigation or proceeding pending, or to the knowledge of Catheter or the SHAREHOLDERS, threatened against, or affecting any of the properties of Catheter before any court or any administrative tribunal, which, if adversely determined would have a material adverse effect on the conditions, financial or otherwise, or business of Catheter, and which are not adequately covered by insurance;

2.5 that Catheter has and on the Closing Date will have, except for the liens and encumbrances described in "Exhibit C", good and marketable title to all property and assets reflected in the balance sheet of Catheter as of November 30, 1959, except property and assets disposed of in the usual, regular and ordinary course of business subsequent to the date of said balance sheet;

2.6 that, except for the obligations and indebtedness described in "Exhibit C" attached hereto, Catheter is not under any obligation wherein it is primarily or contingently liable to any party other than those obligations which are customary in the usual, regular and ordinary course of the business of Catheter and that any lease, contract, undertaking or other commitment which it has (except those involving the purchase of inventories and sale of products made in the usual, regular and ordinary course of business and except for the aforementioned obligations and indebtedness described in "Exhibit C"), involves an expenditure, obligation, purchase or sale by Catheter of no more than $2,000, or can be fully performed or terminated by Catheter within one year from the date hereof;

2.7 that Catheter has no employment contracts or agreements with any officer or employee which is not terminable, without liability, immediately upon notice of termination;

2.8 that Catheter does not have and on the Closing Date will not have any pension, bonus, profit sharing or stock purchase plans or arrangements;

2.9 that Catheter has no liability to David S. Sheridan or any other party for royalties or similar payments in connection with the making, using or sale of products either patented or patentable.

2.10 that the shares of Common Stock of BRUNSWICK which SHAREHOLDERS are to receive pursuant to this Agreement are being acquired by them for investment and not for distribution and that they have individually received from BRUNSWICK copies of BRUNSWICK'S Annual Report for 1958 and quarterly financial reports for the first, second and third quarters of the year 1959 as mailed to holders of BRUNSWICK'S Common Stock and such other financial information as they have requested;

2.11 that each SHAREHOLDER is, and on the Closing Date will be the owner, free and clear of any encumbrances, of not less than the number of shares of Catheter Common Stock set forth under the first column opposite the name of each SHAREHOLDER in the table appearing in "Exhibit A" hereto; that such shares are fully paid and non-assessable; and that each SHAREHOLDER has, and on the Closing Date will have, the legal right and all authorization and approval required by law, to transfer and exchange such shares pursuant to this Agreement;

2.12 that the execution of this Agreement, the performance of the covenants herein contained, and the consumation of the transactions herein contemplated, will not result in any breach of any of the terms, conditions or provisions of, or constitute a default under, or result in the creation of any lien, charge or encumbrance upon any property or assets of Catheter pursuant to any corporate indenture, agreement or other instrument to which either Catheter or any SHAREHOLDER is a party or by which any of them may be bound or affected;

REPRESENTATIONS OF BRUNSWICK

3. BRUNSWICK represents and warrants to SHAREHOLDERS as follows:

3.1 that BRUNSWICK is, and at the Closing Date will be a corporation duly organized and existing in good standing under the laws of the State of Delaware;

3.2 that the shares of its Common Stock deliverable to SHAREHOLDERS hereunder will, upon such delivery, be validly issued, fully paid and non-assessable shares on a parity in all respects with all other outstanding shares of BRUNSWICK Common Stock; that said shares will be duly listed, upon notice of issuance, on the New York, Midwest and Pacific Coast Exchanges; and that based upon the representations of SHAREHOLDERS herein said shares when issued pursuant to the provisions of this Agreement will be exempt from registration under the Securities Act of 1933;

3.3 that the shares of Catheter Common Stock which BRUNSWICK is to receive in exchange for shares of BRUNSWICK Common Stock are not being acquired by it with a view to the public distribution thereof;

EXCHANGE OF SHARES

4. Each SHAREHOLDER agrees with BRUNSWICK and BRUNSWICK agrees with each SHAREHOLDER, to exchange the shares of Catheter Common Stock owned by such SHAREHOLDER for shares of BRUNSWICK Common Stock on the following basis;

4.1 On the Closing Date BRUNSWICK shall issue, from its authorized but unissued shares, and deliver to SHAREHOLDERS 4080 shares of BRUNSWICK Common Stock; provided, however, that if the Adjusted Net Worth of Catheter shall:

4.1.1 be less than $194,843.75, the number of shares of BRUNSWICK Common Stock to be so delivered shall be decreased by the nearest number of whole shares determined by dividing the excess of $194,843.75 over the Adjusted Net Worth by $47.75, or

4.1.2 be more than $194,843.75 the number of shares of BRUNSWICK Common Stock which BRUNSWICK shall so deliver shall be increased by the nearest number of whole shares determined by dividing the excess of the Adjusted Net Worth over $194,843.75 by $47.75.

4.2 the aggregate number of shares of BRUNSWICK Common Stock issuable pursuant to subparagraph 4.1 shall be distributed to the SHAREHOLDERS individually by applying the percentage set forth in the column following the individual SHAREHOLDERS name to the aggregate number of shares of BRUNSWICK Common Stock issuable, provided, that no distribution of a fractional share of BRUNSWICK Common Stock shall be made, but in lieu thereof, BRUNSWICK shall deliver to each SHAREHOLDER entitled to a fraction in excess of one-half share, one full share of BRUNSWICK Common Stock and fractions of one-half share or less shall be disregarded.

4.3 In the event that prior to the date for any delivery of BRUNSWICK Common Stock hereunder each of the outstanding shares of BRUNSWICK Common Stock shall be changed into or exchanged for a different number or kind of shares of stock or other securities of BRUNSWICK or of another corporation (whether by reason of merger, consolidation, recapitalization, reclassification, split-up, combination of shares or otherwise) then there shall be substituted for each share of BRUNSWICK Common Stock deliverable to SHAREHOLDERS pursuant to this Agreement, the number and kind of shares of stock or other securities into which each outstanding shares of BRUNSWICK Common Stock shall be so changed or for which each such share shall be so exchanged. For the purpose of this Agreement, a dividend declared after the

Contract Date payable in shares of BRUNSWICK Common Stock shall be deemed to be a split-up, but there shall be no adjustment hereunder on account of the declaration or payment of any cash dividends on shares of BRUNSWICK Common Stock.

WARRANTIES OF SHAREHOLDERS

5. SHAREHOLDERS covenant, warrant and agree that since November 30, 1959 through and including the Closing Date, SHAREHOLDERS have caused and will cause Catheter to operate its business in the usual, regular and ordinary course, and not otherwise, unless prior written approval for any variation therefrom shall first have been received from BRUNSWICK, without limiting the generality of the foregoing, SHAREHOLDERS specifically covenant;

5.1 that no compensation of any kind, including, but not limited to bonuses, salaries and pensions have been or shall be paid to the officers and managing personnel of Catheter by Catheter nor has or shall any employment contract other than the employment contract set forth in "Exhibit D" be entered into by Catheter without the prior written approval of BRUNSWICK; provided however, that salaries at the rate payable to or on behalf of the officers and managing personnel of Catheter on November 30,,1959, shall be continued without change;

5.2 that Catheter has not declared and will not declare or pay dividends, or made or will make any other distribution on or in respect of any shares of its capital stock and has not and will not purchase, acquire, redeem or retire or make any commitment to purchase, acquire, redeem or retire any shares of its capital stock or made or will make any change in its authorized or issued capital stock;

5.3 that Catheter has not and will not, unless BRUNSWICK'S prior written approval shall first have been obtained, incur any indebtedness or enter into any contractual obligation or do any act or thing, other than is customary in the usual, regular and ordinary course of its business, provided however, that notwithstanding anything herein contained, no lease, contract, undertaking or other commitment has been or shall be made or agreed upon (except those involving purchase of inventories and sale of products made in the usual, regular and ordinary course of its business and those described in "Exhibits D, E and F", which either involves an expenditure, obligation, purchase or sale by Catheter of more than $2,000 or which cannot be fully performed or terminated by it within one year from the Contract Date (of this Agreement):

5.4 that Catheter has and will maintain all of its properties and assets in as good repair, order and condition as at the date hereof, reasonable wear and use excepted;

5.5 that Catheter has and will maintain and keep in full force and effect all of the fire and other insurance on its property, all of the liability and other casualty insurance, and all bonds on personnel which it presently carries;

5.6 that Catheter will allow, at all reasonable times, two of BRUNSWICK'S employees or agents to come upon its property and observe the conduct of its business and permit BRUNSWICK to have access to and examine the books and records of Catheter.

CONDITIONS PRECEDENT TO BRUNSWICK'S OBLIGATION

6. The obligation of BRUNSWICK to consumate this Agreement is subject to the following express conditions precedent:

6.1 The representations and warranties of SHAREHOLDERS contained in Paragraphs 2 and 5 of this Agreement were true when made and shall be true at and as of the Closing Date as though such representations and warranties had been made at and as of the Closing Date, and SHAREHOLDERS shall have performed or caused Catheter to have performed, all agreements on their part required to be performed and shall not be in default under any of the provisions of this Agreement, at or prior to the Closing Date and SHAREHOLDERS shall deliver to BRUNSWICK at the Closing Date a certificate of David S. Sheridan, as to the compliance by SHAREHOLDERS with the representations and warranties contained in this subparagraph;

6.2 At the Closing Date, there shall exist no violations of any Federal, State or Local Law or regulations materially affecting the properties and assets of Catheter;

6.3 BRUNSWICK shall have received an opinion, in scope and substance satisfactory to its General Counsel, of Mr. _____ of _____, dated as of the Closing Date, to the effect:

6.3.1 that Catheter is duly incorporated and validly existing in good standing under the laws of the State of New York.

6.3.2 that Catheter's authorized capital stock consists only of 500 shares of Common Stock of which only 260 shares are issued and outstanding and are the subject matter of this Agreement, and that each of said issued and outstanding shares is validly issued, fully paid and non-assessable;

6.3.3 that this Agreement has been duly executed and delivered by SHAREHOLDERS and is valid and enforceable against SHAREHOLDERS in accordance with its terms;

6.3.4 that the Employment Agreement attached hereto as Exhibit D has been duly executed and delivered by David S. Sheridan and is valid and enforceable against David S. Sheridan in accordance with its terms;

6.3.5 that the Lease and Land Option Contract attached hereto as Exhibits F and G have been duly executed and delivered by the fee owner or owners of the subject real estate and are valid and enforceable by Catheter in accordance with their terms and conditions;

6.3.6 that based upon an examination by said counsel or by a reputable title company, there are no liens, encumbrances, conditional sales agreements or other rights of third parties of record with respect to any personal property included in the assets of Catheter and reflected in the balance sheet to be prepared as provided for in Paragraph 8 hereof as of the Audit Date;

6.3.7 that each SHAREHOLDER, at the Closing Date, has marketable title to the number of shares of Catheter Common Stock exchangeable by him, pursuant to this Agreement, for shares of BRUNSWICK Common Stock, and has the legal right and power and all authorization and approval required by law to transfer and deliver such shares to BRUNSWICK pursuant to this Agreement and that such delivery will pass title to BRUNSWICK to such shares free and clear of any claim, encumbrance or equity;

6.4 that prior to the Closing Date Catheter shall not have sustained any material loss or interferences with its business from fire, flood, explosion, or other calamity, whether or not covered by insurance and BRUNSWICK shall have received on the Closing Date a certificate dated the Closing Date, signed by David S. Sheridan to that effect;

6.5 that BRUNSWICK shall have received within a reasonable time after the execution of this Agreement, copies of all corporate and other documents in possession of SHAREHOLDERS and Catheter which BRUNSWICK shall have requested and may reasonably require in connection with the transactions provided for in this Agreement, certified in such manner, as BRUNSWICK may reasonably request;

6.6 that BRUNSWICK shall have been permitted to exercise its rights provided for in subparagraph 5.6 of this Agreement;

6.7 David S. Sheridan shall have entered into an Employment Agreement in the form of "Exhibit D" attached hereto;

6.8 David Sheridan shall have entered into the License Agreement with Catheter in the form of "Exhibit E" attached hereto;

6.9 Catheter shall have entered into a lease in the form of "Exhibit F", attached hereto.

6.10 Catheter shall have entered into the Land Option Contract in the form of "Exhibit G" attached hereto;

CONDITIONS PRECEDENT TO SHAREHOLDER'S OBLIGATION

7. The obligation of SHAREHOLDERS to consumate this Agreement is subject to the following express conditions precedent;

7.1 the warranties of BRUNSWICK contained in paragraph 3 of this Agreement shall be true at and as of the Closing Date with the same effect as though such warranties had been made at and as of the Closing Date, and BRUNSWICK shall have performed all agreements on its part required to be performed, and shall not be in default under any of the provisions of this Agreement at or prior to the Closing Date.

7.2 SHAREHOLDERS shall have received from Messrs. Mayer, Friedlich, Spiess, Tierney, Brown and Platt, its opinion dated as of the Closing Date to the effect;

7.2.1 that BRUNSWICK is a corporation duly organized and existing in good standing under the laws of the State of Delaware;

7.2.2 that this Agreement has been duly executed and delivered by BRUNSWICK and is valid and enforceable against BRUNSWICK in accordance with its terms;

7.2.3 that the shares of Common Stock of BRUNSWICK deliverable to SHAREHOLDERS pursuant to this Agreement, will, upon receipt by BRUNSWICK of the Catheter Common Stock pursuant to this Agreement, be validly issued, fully paid and non-assessable shares on a parity in all respects with all other outstanding shares of BRUNSWICK Common Stock at the Closing Date, that said shares of BRUNSWICK will be duly listed, on notice of issuance, on the Midwest, Pacific Coast and New York State Exchanges; and that based upon the representations of SHAREHOLDERS said shares when issued pursuant to the provisions of this Agreement are exempt from registration under the Securities Act of 1933.

7.3 BRUNSWICK and Catheter shall have entered into an employment contract in the form of "Exhibit D" attached hereto, with David S. Sheridan;

7.4 BRUNSWICK shall have entered into an Exclusive License Agreement with David Sheridan in the form of "Exhibit E" attached hereto.

AUDIT AND CERTIFICATION OF ADJUSTED NET WORTH

8. BRUNSWICK will engage the firm of Arthur Andersen and Company, Certified Public Accountants, to conduct an audit of Catheter as of the Audit Date and to prepare a Certified Balance Sheet of Catheter on the same basis as of November 30, 1959. In preparing said Balance Sheet all assets shall be valued at the book value thereof, except that the inventory of raw material shall be valued at the lower of cost or market, nor will any other charges or credits be made which do not conform to generally accepted accounting principles. Said Certified Balance Sheet shall be such that it meets with the approval of Ball, George & Co. Certified Public Accountants, who may represent and be compensated by SHAREHOLDERS, if SHAREHOLDERS so elect. Adjusted Net Worth as computed for the purpose of this Agreement shall equal the sum of (i) the actual net worth as determined by the foregoing Certified Balance Sheet plus (ii) $99,401.45.

CLOSING

9. The time, place and manner of closing this transaction shall be as follows:

9.1 Subject to the other provisions of this Agreement, the exchange of Catheter Common Stock for BRUNSWICK Common Stock shall take place on the Closing Date;

9.2 The closing shall take place at BRUNSWICK'S offices at 623 South Wabash Avenue, Chicago, Illinois, or at such other place as those parties may, for their mutual convenience, select;

9.3 At the Closing Date, SHAREHOLDERS will deliver to BRUNSWICK the following:

9.3.1 Certificates evidencing the shares of Catheter Common Stock exchangeable for shares of BRUNSWICK Common Stock hereunder. All such certificates shall be duly endorsed in blank for transfer and shall have affixed thereto Federal Stock Transfer Stamps covering the applicable Stock Transfer Tax;

9.3.2 Resignations of all members of the Board of Directors and of all officers of Catheter which BRUNSWICK shall request in writing prior to the Closing Date;

9.3.3 Unless previously delivered, the certificate of David S. Sheridan conforming to the requirements of subparagraph 6.1 herein;

9.3.4 Unless previously delivered, the opinion of _____ conforming to the requirements of subparagraph 6.3 herein; and

9.3.5 Unless previously delivered, the certificate signed by David S. Sheridan conforming to the requirements of subparagraph 6.4 herein.

9.4 At the Closing Date, BRUNSWICK will deliver to SHAREHOLDERS the following:

9.4.1 Certificates to each SHAREHOLDER issued in the name of such SHAREHOLDER for the number of shares of BRUNSWICK Common Stock deliverable to such SHAREHOLDER pursuant to this Agreement, and

9.4.2 unless previously delivered, the opinion of Messrs. Mayer, Friedlich, Spiess, Tierney, Brown and Platt conforming to the requirements of subparagraph 7.2 herein.

COVENANTS TO SURVIVE CLOSING

10. All covenants, agreements, representations and warranties made herein and any instruments and certificates delivered pursuant hereto shall survive the closing, regardless of any investigation made by or on behalf of any party.

NOTICES

11. Any notice given hereunder shall be in writing and shall be mailed by certified mail, postage prepaid, addressed if given by BRUNSWICK to

Mr. David S. Sheridan
Argyle, New York

and if given by SHAREHOLDERS, to:

The Brunswick-Balke-Collender Company
623 South Wabash Avenue
Chicago 5, Illinois

Attention: General Counsel

or mailed to such other address as SHAREHOLDERS or BRUNSWICK, respectively, may designate by notice given in like manner, and any such notice shall be deemed to have been given when received.

BROKERS COMMISSIONS

12. SHAREHOLDERS and BRUNSWICK each warrant that they know of no corporation, firm or person entitled to receive from them, any brokerage commission or finders' fees in connection with this transaction.

AGREEMENT TO BIND SUCCESSORS AND ASSIGNS

13. Whenever in this Agreement, SHAREHOLDERS or BRUNSWICK are referred to, such reference shall include the heirs, executors, administrators, successors and assigns of SHAREHOLDERS and BRUNSWICK respectively, and SHAREHOLDERS' and BRUNSWICK's respective covenants, agreements, obligations and warranties shall inure to the benefit of, and be the obligation of the respective heirs, executors, administrators, successors and assigns of SHAREHOLDERS and BRUNSWICK.

IN WITNESS WHEREOF, the respective SHAREHOLDERS have executed this Agreement, individually or by attorney-in-fact, and BRUNSWICK has caused this Agreement to be signed in its corporate name and under its corporate seal, by its officers thereunto duly authorized as of the day and year first above written.

THE BRUNSWICK-BALKE-COLLENDER COMPANY

(Corporate) (Seal)

By: [signature]
Vice President

ATTEST:

[signature]
Ass't. Secretary

[signature]
David S. Sheridan

[signature]
Janet R. Sheridan

EXHIBIT "A"

Name of SHAREHOLDER	Number of Shares of Catheter Common Stock	Percentage of Shares of BRUNSWICK Common Stock Exchangeable for Catheter Common Stock
David S. Sheridan	259	99.6%
Janet R. Sheridan	1	0.4
	260	100.0%

EXHIBIT "A"

EXHIBIT B

SHERIDAN CATHETER AND INSTRUMENT CORP.
Argyle, New York
Statement of Financial Condition
November 30, 1959

Assets

Current Assets		
Cash in bank, checking		$ 32,603.5
Cash in bank, time deposits		40,000.0
Accounts receivable, trade		5,320.4
Accrued interest receivable		200.0
Inventory of raw materials and supplies (at cost)		6,200.0
		$ 84,323.9
Other Assets		
Notes receivable, officer		7,000.0
Accounts receivable, officer		5,083.4
Organization expense		735.0
		$ 12,818.
Fixed Assets		
Leasehold improvements	$ 1,513.12	
Machinery and equipment	38,754.78	
	$40,267.90	
Less, accumulated depreciation	9,104.85	31,163.
		$128,305.

Liabilities

Current Liabilities		
Accounts payable, trade		$ 1,515.
Employees deductions		535.
Accrued payroll taxes		158.
Accrued franchise tax		3,563.
Accrued federal income tax, estimated		27,090.
		$ 32,863.
Capital		
Capital Stock		
Common Stock, no par value		
(Authorized 500 shares, 260 shares issued)	$16,334.00	
Retained earnings	79,108.30	95,442.
		$128,305.

I hereby certify that the foregoing State of Financial Condition is complete and fairly reflects the financial condition, including contingent liabilities of Sheridan Catheter and Instrument Corp. as of November 30, 1959.

David S. Sheridan

EXHIBIT "C"

(Schedule of liens and encumbrances
described in subparagraphs 2.5 and 2.6)

EXHIBIT "C"

E X H I B I T "D"

(David S. Sheridan Employment Agreement)

E X H I B I T "D"

E X H I B I T "E"

(License Agreement)

E X H I B I T "F"

AGREEMENT, dated and effective the 11 day of [illegible], 1960, between DAVID S. SHERIDAN, an individual, residing at Argyle, New York, hereinafter called "SHERIDAN" or "LICENSOR", and BRUNSWICK-BALKE-COLLENDER COMPANY, a corporation of Delaware, having a principal place of business at 623 South Wabash Avenue, Chicago, Illinois, hereinafter called "BRUNSWICK" or "LICENSEE".

RECITALS

Concerning Licensor

A. SHERIDAN represents that he has, as a result of his inventive skill and by his own expenditure of money and time over a period of years, acquired valuable know-how, data and operating skill relative to processes and apparatus for producing extruded plastic products and has made certain inventions and improvements relating thereto and to products resulting therefrom.

B. SHERIDAN represents to BRUNSWICK that he has the right to grant exclusive licenses under "LICENSOR's Patents" (as such term is defined hereinafter).

C. SHERIDAN desires the assistance of a responsible manufacturer in developing and increasing the market and use of his inventions and improvements since he does not have the extensive manufacturing and sales organization needed to exploit his developments to the fullest.

PLAINTIFF'S EXHIBIT 3

D. SHERIDAN represents and warrants that as of the date hereof there have been no known infringements of "LICENSOR's Patents" and SHERIDAN has not been charged with infringement of adversely held patents.

Concerning Licensee

A. BRUNSWICK desires to obtain an exclusive license to make, use and sell products covered by LICENSOR's Patents" and to utilize the processes and apparatus covered by "LICENSOR's Patents" in the manufacture thereof.

B. BRUNSWICK desires to have the exclusive right to sub-license other manufacturers to practice the inventions and improvements in medico-surgical devices developed by SHERIDAN.

C. BRUNSWICK desires to cooperate with SHERIDAN to develop increased markets and sales of medico-surgical devices through an arrangement whereby the extensive manufacturing and sales organization of BRUNSWICK and its related companies can be used to exploit the improvements and inventions relating thereto created by SHERIDAN.

WHEREFORE, in consideration of the valuable inducements apparent from the above recitals and the mutual and reciprocal promises hereafter set forth, the parties hereto agree as follows:

ARTICLE I

Rights and Like Extended by
and Obligations of Licensee

Section 1.1 - Grant to Licensee of Licensor's Patents

SHERIDAN hereby grants to BRUNSWICK and BRUNSWICK hereby accepts, subject to the covenants and conditions hereinafter expressed, the exclusive right, license and privilege of making and of using and of selling throughout the world, any and all products and devices covered by "LICENSOR's Patents" and of using any and all processes covered by "LICENSOR's Patents". The right to make, use or sell as covered by this grant applies to LICENSEE, per se, or any of its subsidiaries, divisions, agents, sub-contractors or the like.

Section 1.2 - Sublicense Rights to Licensee

SHERIDAN hereby grants to BRUNSWICK and BRUNSWICK hereby accepts, subject to the covenants and conditions hereinafter expressed, the right to grant to other manufacturers under the rights granted to BRUNSWICK in Section 1.1 of this Article I, sublicenses under "LICENSOR's Patents."

All sublicenses granted by LICENSEE shall contain covenants by the sublicensee necessary to meet the provisions and conditions specified hereunder.

A conformed copy of any sublicense granted by LICENSEE to a sublicensee domiciled in the United States

or Canada shall be furnished SHERIDAN within five days of the final execution thereof. As regard sublicenses granted to sublicensees domiciled in a country other than the United States or Canada, SHERIDAN agrees that LICENSEE shall be required only to advise SHERIDAN in writing the name and address of the sublicensee, the effective date and term of the sublicense and the royalty provisions thereof applicable to SHERIDAN.

Section 1.3 - Know-How, Information, etc.

SHERIDAN agrees promptly after the effective date of this agreement to communicate to BRUNSWICK (and agrees not to communicate to others) all the technical know-how, data or other information pertinent to "LICENSOR's Patents" and trade-secrets, and agrees to give to BRUNSWICK copies of all of "LICENSOR's Patents."

ARTICLE II

Duration and Termination

Section 2.1 - Term of Agreement

This agreement and the licenses herein granted shall continue in force for a term extending until the date of expiration of the last of "LICENSOR's Patents" to expire unless this grant is sooner terminated, as provided for herein.

Section 2.2 - Special Relief Under Invalid Claims

SHERIDAN agrees if any claim or claims of any of "LICENSOR's Patents" should be held invalid by decision of a court of last resort or by a lower court from whose

decision no appeal is seasonably taken, then such claim or claims shall no longer be considered in the determination of the term of this agreement or the determination of royalties to be paid under this agreement by LICENSEE and sublicensees.

Section 2.3 - Termination by Default

If any royalty due SHERIDAN shall not be paid to SHERIDAN within sixty (60) days after such royalty becomes payable, SHERIDAN shall have the right to cancel this agreement if after written demand LICENSEE has not cured such default within thirty (30) days. Such cancellation shall be effected by giving LICENSEE and sublicensees (if any) written notice thereof.

Section 2.4 - Effect of Termination as to License on Sublicenses

In the event that this agreement is terminated as to LICENSEE, the sublicenses extended by LICENSEE shall simultaneously terminate, but SHERIDAN agrees to grant to any sublicensee who has not breached or voluntarily surrendered its license, a nonexclusive, nonassignable license, under the same "LICENSOR Patents" at the same royalty rate and other conditions provided in the sublicense extended by LICENSEE, provided said sublicensee makes written application therefor within sixty (60) days of written notice by SHERIDAN to the sublicensee of the termination of the agreement as to LICENSEE.

Section 2.5 - Termination by Licensee

BRUNSWICK shall have no right of termination of this agreement until February 19, 1965.

Subsequent to February 19, 1965, BRUNSWICK may terminate the agreement by giving SHERIDAN written notice thereof on or before February 19, 1964. If the agreement is not so terminated on February 19, 1965, it shall continue without right to terminate by BRUNSWICK for another five (5) year period, until February 19, 1970, when BRUNSWICK may terminate the agreement by giving SHERIDAN written notice thereof on or before February 19, 1969. If the agreement is not so terminated on February 19, 1970, it shall continue without right to terminate by BRUNSWICK for another five (5) year period until February 19, 1975, when BRUNSWICK may terminate the agreement by giving SHERIDAN written notice thereof on or before February 19, 1974.

Subsequent to February 19, 1975, BRUNSWICK may terminate the agreement without restriction by giving SHERIDAN sixty (60) days prior notice in writing.

Section 2.6 - Reversion of Property on Termination

The entire right, title and interest of any of "LICENSOR's Patents" shall immediately revest in SHERIDAN upon termination of this agreement.

BRUNSWICK agrees, upon termination of this agreement, to assign to SHERIDAN the entire right, title and interest of any patents or patent applications covering

inventions made solely by SHERIDAN or jointly by SHERIDAN and any employee of BRUNSWICK while SHERIDAN is an employee of BRUNSWICK.

Section 2.7 - Obligations Related to Termination

Termination of this agreement shall not terminate any obligation of either party, their heirs, legal representatives, successors or assigns, to the other hereinunder which occurred prior to such termination and was not discharged.

It is expressly agreed that failure by either party to exercise any of the rights of termination hereunder upon the happening of any condition precedent thereto shall not affect any subsequent right of termination by the party.

Upon termination of this agreement, BRUNSWICK shall discontinue the manufacture and/or sale of all products or devices covered by any unexpired claims of "LICENSOR's Patents" and shall henceforth not resume such manufacture, sale or use for as long as BRUNSWICK would have been obligated to pay royalties thereon to SHERIDAN had this agreement not been terminated, except that BRUNSWICK and its sublicensees may sell all products or devices on hand or on order on the date of termination.

Section 2.8 - Effect of Death or Retirement of Sheridan

In the event SHERIDAN should die while this agreement is in force, SHERIDAN's heirs or assigns shall continue to receive royalties as specified in Article III

hereof, provided upon such death of SHERIDAN, his heirs or assigns shall execute such instruments as may be required to place record title of "LICENSOR's Patents" in BRUNSWICK and BRUNSWICK shall no longer have a right to terminate the agreement.

ARTICLE III

Royalty, Statement, Payment and Like Obligations of Licensee and Sublicensees

Section 3.1 - Licensee Royalty

BRUNSWICK agrees to pay to SHERIDAN royalties for so long as SHERIDAN shall be an employee of BRUNSWICK on all products including "Licensed Products" made and sold by the Sheridan Catheter and Instrument Corp. at the rate specified in Appendix I. BRUNSWICK agrees to pay to SHERIDAN during the term of this agreement when SHERIDAN is not an employee of BRUNSWICK, royalties on all "Licensed Products" made and sold by Sheridan Catheter and Instrument Corp. at the rate specified in Appendix I.

BRUNSWICK further agrees to pay to SHERIDAN royaltien on all "Licensed Products" which are not made by the Sheridan Catheter and Instrument Corp. and which are made and sold by BRUNSWICK at the rates specified in Appendix I.

Said royalties shall be payable at Argyle, New York, or at such other place as SHERIDAN may hereafter direct in writing and payment shall be in United States dollars unless BRUNSWICK is prevented from converting

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foreign royalties into United States dollars by currency regulations of a foreign country, in which case BRUNSWICK may elect to deposit to SHERIDAN's credit in a bank designated by SHERIDAN in the foreign country, the amount of royalties in the foreign currency.

Section 3.2 - Minimum Royalties

BRUNSWICK agrees to pay to SHERIDAN for the first five (5) years of this agreement, not less than twenty thousand ($20,000.00) dollars per annum. Such minimum royalties shall be paid to SHERIDAN in quarterly amounts of five thousand ($5,000.00) dollars per quarter.

Royalties paid to SHERIDAN that derive from sub-licenses shall not be credited to BRUNSWICK in calculation of minimum royalties as required by this agreement.

Section 3.3 - Sublicensing Royalties

Any sublicense granted by BRUNSWICK in accordance with the provisions of this agreement to a sublicensee manufacturing in the United States shall contain a covenant by the sublicensee to pay royalties on all "Licensed Products" sold by sublicensee at a rate not less than that to be paid by BRUNSWICK as specified in Appendix I. BRUNSWICK agrees to pay to SHERIDAN a royalty on all "Licensed Products" covered by any sublicense granted by BRUNSWICK to a sublicensee manufacturing in the United States, and sold by the sublicensee at the rate specified in Appendix I and any royalty in excess of this charged of

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the sublicenses shall become the property of BRUNSWICK.

Any sublicense granted by BRUNSWICK to a foreign sublicensee manufacturing in other than the United States shall contain a covenant by the sublicensee to pay royalties on all products or devices used or sold by sublicensee at a rate to be determined by BRUNSWICK in good faith in the exercise of its sound business judgment and SHERIDAN shall receive one-half of such royalties.

BRUNSWICK shall not be entitled to any remuneration whatsoever from SHERIDAN, or out of royalties due SHERIDAN, in connection with the sublicense provisions of this agreement.

Section 3.4 - Keeping of Records and Accounting

LICENSEE agrees that it will keep in the United States full and accurate books of account showing the exact and entire amount of all products covered by this agreement sold by it and the amount of royalties due and payable by LICENSEE and sublicensees and that it will during January, April, July and October beginning with April, 1960, render to SHERIDAN written statements of account verified, if required by SHERIDAN, under oath by an officer of LICENSEE, setting forth the amount of royalties due and payable by LICENSEE and sublicensees and deliver such statements of account to SHERIDAN at Argyle, New York, or at such other place as SHERIDAN may direct in writing. With its first written statement BRUNSWICK need only pay the minimum

royalties accruing from February 19 to March 31, 1960, on a pro-rated basis. If LICENSEE should not receive royalty reports from its foreign sublicensees in time to include a report of the amount of royalties due and payable in the preceding quarterly period, LICENSEE may include such information in the next quarterly report to SHERIDAN and deliver the amount due in accordance with such report.

LICENSEE agrees that on the day of rendition of each statement of account, it will pay to SHERIDAN the royalties which may then be due in accordance with the rendered statement of account.

Section 3.5 - Licensor Verification of Records

SHERIDAN shall have the right at all reasonable times during business hours to have an independent certified public accountant inspect the books of account referred to in Section 3.4 of this Article III, and also other records, data and memoranda relating to the manufacture, use, sale and shipment of the products and devices covered by this Agreement for the purpose of verifying the statements of account and payments of royalties referred to herein.

ARTICLE IV

Litigation and Patent Prosecution

Section 4.1 - Licensee's Recognition of "LICENSOR's Patents"

BRUNSWICK admits and agrees to respect the validity of "LICENSOR's Patents" and to refrain from

directly or indirectly contesting the same, or from giving aid, comfort or assistance to any person or persons, natural or artificial, who may attempt to contest the validity or scope of "LICENSOR's Patents" and BRUNSWICK further agrees to cooperate fully with SHERIDAN in defense of "LICENSOR's Patents" against all attacks on their validity or scope, but BRUNSWICK shall not be obligated to bear any of the cost of such defense except as provided in Section 4.2.

Section 4.2 - Rights and Obligations in Event of Infringement

BRUNSWICK agrees that SHERIDAN shall be under no obligation to institute suits or prosecute infringers under "LICENSOR's Patents" nor shall SHERIDAN be in any way responsible or liable to BRUNSWICK or its sublicensees for failure to prosecute infringers.

BRUNSWICK shall have the right to bring suits in the name of SHERIDAN for infringement under any of "LICENSOR's Patents," at BRUNSWICK's sole expense and through counsel of its own choosing, and if it takes such action it shall have control of such litigation. SHERIDAN, however, shall have the right to be represented in such litigation by his own counsel at his own expense. Any recovery from such litigation shall be the property of BRUNSWICK.

In the event BRUNSWICK fails to bring suit against infringers within ninety (90) days of receipt of notice or information as to infringement, SHERIDAN shall have the

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right to institute such action in his own name, at his own expense, through counsel of his own selection. In such an event, control of such litigation shall rest with SHERIDAN, but BRUNSWICK shall have the right to be represented by its own counsel, at its own expense, in such proceeding. Any recovery resulting from such litigation shall belong to SHERIDAN.

Section 4.3 - Legal Actions Against Licensee

BRUNSWICK agrees that SHERIDAN shall be under no obligation or in any way responsible or liable to BRUNSWICK or its sublicensees for any damages or the like arising out of any suit in equity or action at law brought against BRUNSWICK or its sublicensees for infringement of patents or for any other matter in consequence of their operations under this agreement. In the event BRUNSWICK or its sublicensees should be sued for infringement of patents in consequence of its operations hereunder, BRUNSWICK agrees to notify SHERIDAN and to permit SHERIDAN, at SHERIDAN's expense, to participate in the defense thereof, if SHERIDAN so elects.

ARTICLE V

Additional Conditions and Provisions

Section 5.1 - Notices to Other Parties

Notices and written statements hereunder shall be deemed to have been duly given upon the mailing thereof,

by registered or certified mail, postpaid, to the party entitled thereto at its address as the same may from time to time be designated to the other party. Until changed by written notice, the addresses of the parties shall be:

LICENSOR: David S. Sheridan
Argyle, New York

LICENSEE: BRUNSWICK-BALKE-COLLENDER COMPANY
623 South Wabash Avenue
Chicago 5, Illinois

Section 5.2 - Marking Products with Patent Notice

LICENSEE agrees that all products sold under this license or sublicenses shall be marked in accordance with the provisions of Title 35, Section 287 of the U.S. Code Annotated, as the same shall from time to time be amended. LICENSEE also agrees that all products used or sold by it in any country or jurisdiction foreign to the United States under this license agreement, shall be marked and handled in accordance with the laws of such foreign country.

Section 5.3 - Trademarks and the Like of Licensees

All trademarks, trade names, slogans, designs, advertising, art work, or the like, used by LICENSEE or its sublicensees in the manufacture and sale of the products shall, notwithstanding any termination or expiration of this agreement, forever be and remain the sole property of the respective LICENSEE or sublicensee.

Section 5.4 - Transfer of Agreement

SHERITT shall not have the right to transfer or assign this agreement or any part thereof, without the prior written consent of BRUNSWICK.

BRUNSWICK shall have the right to transfer or assign this License together with its entire assets and liabilities to a subsidiary, to a Company of which BRUNSWICK is, or may be a subsidiary, or to the successor of the entire business of BRUNSWICK.

Section 5.5 - Law That Governs

This agreement shall be construed in accordance with the law of the State of New York insofar as such law is existent or applicable and can or will be applied in the jurisdiction in which either party may seek an adjudication of any matter connected with this agreement.

ARTICLE VI

Definitions

Section 6.1 - General

The words, terms or phrases set forth in this article, when used in this agreement, shall have the meanings as defined herein.

Section 6.2 - "Licensor's Patents"

The term "LICENSOR's Patents" means the Letters Patents set forth in the attached Exhibit A and any reissue thereof, either collectively in groups, singly, or any claim

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or claims of any such Letters Patents. The term also includes any applications for Letters Patent set forth in the attached Exhibit A and any divisions, continuations and continuations-in-part thereof together with patents issuing thereon and reissues thereof.

Section 6.3 - "Licensed Products"

The term "Licensed Products" shall mean products coming under one or more claims of "LICENSOR's Patents", or made using a process covered by one or more of the claims of "LICENSOR's Patents."

Section 6.4 - "Net Sales"

The term "net sales" means the gross sales as invoiced by the LICENSEE or sublicensee, less discounts allowed and less import duties or sales taxes, and absorbed transportation whether stated separately or included in the gross selling prices, and less any amounts paid or credited to customers and on which royalties have previously accrued to SHERIDAN hereinunder, on account of defective devices and the return of devices. Sales and transfers from SHERIDAN Catheter and Instrument Corp. to LICENSEE and its other divisions or subsidiaries, or a company of which LICENSEE is a subsidiary, are to be considered as sales hereunder.

Section 6.5 - "Termination"

The term "termination" means any cancellation to this agreement prior to the full term of the agreement as specified in Section 2.1, but does not include expiration

of the agreement in accordance with said Section 2.1.

Section 6.6 - "Sheridan Catheter and Instrument Corp."

The term "Sheridan Catheter and Instrument Corp." shall include any successor division or affiliate of BRUNSWICK carrying on the business of said Sheridan Catheter and Instrument Corp.

IN TESTIMONY WHEREOF, DAVID S. SHERIDAN, has executed this agreement as his own free will and deed, and BRUNSWICK-BALKE-COLLENDER CO. have caused this agreement to be executed for them and in their names and all have caused their respective seals to be affixed and attested as of the day and year first above written.

DAVID S. SHERIDAN

Attest: _____ _____ L.S.

BRUNSWICK-BALKE-COLLENDER CO.

Attest: _____

Assistant Secretary

By _____

Vice President

ARTICLE I

The royalty rates referred to in Section 3.1, ARTICLE III of the attached Agreement shall be:

Four percent (4%) of sales until the total amount of all sales on which royalties are to be paid under the Agreement equal $500,000 annually; then

Three percent (3%) of sales while the total amount of all sales on which royalties are to be paid under the Agreement are between $500,000 and $1,000,000 annually; and then

Two percent (2%) of sales when the total amount of all sales on which royalties are to be paid under the Agreement are over $1,000,000 annually.

The prices on which the above rates are to be applied to determine the royalties are:

(A) On products and "Licensed Products" manufactured by Sheridan Catheter and Instrument Corp. - Seventy per cent (70%) of SHERIDAN'S lowest list retail price for the product or, at the option of SHERIDAN, the actual "net sales" by SHERIDAN of products or "Licensed Products" except for sales to wholesalers.

(B) On "Licensed Products" not manufactured by Sheridan Catheter and Instrument Corp. - the actual "net sales".

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EXHIBIT "A"

List of Letters Patent and Applications for Letters Patent as Referred to in Section 6.2, ARTICLE VI of the Attached Agreement.

United States	Canada
Patent 2,857,915 "X-Ray Catheters" Patented October 28, 1958	S. N. 759,701 "PRODUCTION OF TAPERED MEDICO-SURGICAL TUBES WHICH HAVE CONTROLLED WALL THICKNESS BY EXTRUSION" Filed October 2, 1958
S. N. 739,628 "PRODUCTION OF TAPERED MEDICO-SURGICAL TUBES WHICH HAVE CONTROLLED WALL THICKNESS BY EXTRUSION" Filed June 3, 1958	S. N. 759,702 "[illegible] EXTRUDED PLASTIC MEDICAL TUBES" Filed October 2, 1958
S. N. 745,134 "[illegible] MEDICO-SURGICAL TUBES HAVING TRANSPARENT CONNECTORS BONDED [illegible]" Filed July 2, 1958	S. N. 759,703 "[illegible] CANNULAE" Filed October 2, 1958
S. N. 745,135 "[illegible]" Filed July 2, 1958	S. N. 759,704 "[illegible] MEDICAL TUBES [illegible]" Filed October 2, 1958
S. N. 745,175 "[illegible] MEDICO-SURGICAL TUBES HAVING AT LEAST ONE TAPERED SECTION THEREIN" Filed July 2, 1958	S. N. 759,705 "X-Ray Catheter" Filed October 2, 1958
S. N. 759,059 "CANNULAE" Filed July 30, 1958	S. N. 759,706 "[illegible] MEDICO-SURGICAL TUBES HAVING AT LEAST ONE TAPERED SECTION THEREIN" Filed October 2, 1958

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PLAINTIFF'S EXHIBIT, Rec'd 3/24/76 3A —— id

Exhibit 3A

AMENDMENT TO EXHIBIT "E"

to correct "Exhibit E" (License Agreement) of Agreement dated and effective the 18th day of February, 1960, between DAVID S. SHERIDAN, an individual, residing at Argyle, New York, hereinafter called "SHERIDAN" or "LICENSOR", and BRUNSWICK-BALKE-COLLENDER COMPANY, a corporation of Delaware, having a principal place of business at 623 South Wabash Avenue, Chicago, Illinois, now by change of name BRUNSWICK CORPORATION, at 69 West Washington Street, Chicago, Illinois 60602, hereinafter called "BRUNSWICK" or "LICENSEE".

It is agreed that the following changes and additions are to be effective as of the original date of said License Agreement and that this Amendment supersedes any and all amendments, if any, that have been heretofore made to said License Agreement.

The last paragraph under Section 2.7 at page 7, line 3, is amended to substitute the word "unexpired" for "expired" so the paragraph will read:

--Upon termination of this Agreement, BRUNSWICK shall discontinue the manufacture and/or sale of all products or devices covered by any unexpired claims of "LICENSOR'S Patents" and shall henceforth not resume such manufacture, sale or use

for as long as BRUNSWICK would have been obligated to pay royalties thereon to SHERIDAN had this Agreement not been terminated, except that BRUNSWICK and its sublicensees may sell all products or devices on hand or on order on the date of termination.--

The paragraph under Section 4.1 at page 10, line 27, is amended to change the word "context" to "contest" so the paragraph will read:

--BRUNSWICK admits and agrees to respect the validity of "LICENSOR'S Patents" and to refrain from directly or indirectly contesting the same, or from giving aid, comfort or assistance to any person or persons, natural or artificial, who may attempt to contest the validity or scope of LICENSOR'S Patents" and BRUNSWICK further agrees to cooperate fully with SHERIDAN in defense of "LICENSOR'S Patents" against all attacks on their validity or scope, but BRUNSWICK shall not be obligated to bear any of the cost of such defense except as provided in Section 4.2.--

Exhibit A of said License Agreement is amended by addition of foreign patents and applications and the identification of patents which have issued on applications as listed in the original exhibit to read:

- - -

EXHIBIT A

List of Letters Patent or Applications For Letters Patent as Referred to in Section 6.2, ARTICLE VI of the Attached Agreement

UNITED STATES	FOREIGN Corresponding Thereto
Patent 2,857,915 "X-Ray Catheter" Oct. 28, 1958	Canada - Patent 630,322 Nov. 7, 1961
S.N. 739,628 (Aloe Case 10) "Production of Tapered Medico-Surgical Tubes Which have Controlled Wall Thickness by Extrusion" Filed June 3, 1958 Patent No. 2,940,126 Issued June 14, 1960	Canada - Patent 636,703 Feb. 20, 1962 Germany - S.N. S71,646 x/39a Filed Dec. 13, 1960 Pending as of March 15, 1966
S.N. 746,134 (Aloe Case 11) "Medico-Surgical Tubes Having Integral Connectors Formed in Their Ends" Filed July 2, 1958 Patent No. 3,042,045 Issued July 3, 1962 Now Re.25,788	Canada - Patent 667,078 July 23, 1963 France - Patent 1,278,405 Oct. 30, 1961 Great Britain - Patent 970,646 January 4, 1961
S.N. 746,135 "Seamless Extruded Plastic Rectal Tubes" Filed July 2, 1958 Patent No. 3,042,044 Issued July 3, 1962	Canada - Patent 694,151 Sept. 15, 1964
S.N. 746,175 (Aloe Case 12) "Extruded Medico-Surgical Tubes Having at Least One Tapered Section Therein" Filed July 2, 1958 - ABANDONED	Canada - Patent 705,681 March 16, 1965 France - Patent 1,278,426 Oct. 30, 1961 Great Britain - Patent 970,645 Jan. 4, 1961 Div. - Patent 970,647 Dec. 20, 1963

EXHIBIT A (cont'd)

UNITED STATES	FOREIGN Corresponding Thereto
S.N. 752,050 "Nasal Cannulae" Filed July 30, 1958 Patent No. 2,931,358 Issued April 5, 1960	Canada - Patent 667,077 July 23, 1963
S.N. 20,311 (Aloe Case 25) "Non-Sparking Medico-Surgical Tubes" Filed April 6, 1960 Patent No. 3,070,132 Issued Dec. 25, 1962	Denmark - Serial No. 5039/62 Filed Nov. 22, 1962 Pending as of March 15, 1966

IN TESTIMONY WHEREOF, DAVID S. SHERIDAN has executed this Amendment to said Exhibit E (License Agreement) of February 18, 1960, as his own free will and deed, and BRUNSWICK CORPORATION has caused this Amendment to said Agreement to be executed for and on its behalf and in its name, and all parties hereto have caused their respective seals to be affixed and attested to as of the 1st day of July, 1966.

_____ (Seal)
David S. Sheridan

ATTEST:

_____

BRUNSWICK CORPORATION

ATTEST: By _____
Vice President

_____
Asst. Secretary
(Corporate Seal)

- -

PHYSICAL EXHIBIT

4. Argyle 6' conductive line ("soft" formulation)

Exhibit 5 2.

PLAINTIFF'S EXHIBIT 5 Dc 3/29/76

EMPLOYMENT AGREEMENT

AGREEMENT entered into as of the 26th day of February, 1960, between DAVID S. SHERIDAN of Argyle, New York (hereinafter referred to as "SHERIDAN"), SHERIDAN CATHETER & INSTRUMENT CORP., a New York Corporation having a place of business at Argyle, New York (hereinafter referred to as "CATHETER"), and THE BRUNSWICK-BALKE-COLLENDER COMPANY, a Delaware Corporation having a place of business at Chicago, Illinois (hereinafter referred to as "BRUNSWICK"), of which CATHETER is a wholly owned subsidiary.

1. CATHETER agrees to and does hereby employ SHERIDAN as head of CATHETER, which will initially be subject to the authority and jurisdiction of Aloe Division of BRUNSWICK, or for such other duties as the parties may hereafter agree upon.

2. This Agreement shall have a term of five (5) years from the date hereof, after which the term of the Agreement will be automatically extended on a year-to-year basis until February 26, 1974, unless any party prior thereto gives the other parties six (6) months' written notice of its election to terminate the Agreement at the end of the five (5) year period or any yearly extension thereafter.

3. SHERIDAN agrees to devote his full time and effort to the performance of his duties for CATHETER. It is agreed between the parties hereto that SHERIDAN will perform his duties hereunder in Argyle, New York, or in such other place, or places, as the parties hereto may mutually agree. For the services to be rendered hereunder, CATHETER agrees to pay SHERIDAN a salary of not less than Twenty Two Thousand Five Hundred Dollars ($22,500.00)

4. Within ten (10) days from February 19, 1960, BRUNSWICK will cause its Restricted Stock Option Plan Committee to grant an option to SHERIDAN pursuant to its Restricted Stock Option Plan, a copy of which has been delivered to SHERIDAN, in the form attached to this Agreement, under which he may purchase a maximum of Forty-Two Hundred (4200) shares of Common Stock of BRUNSWICK at a price equal to Eighty-Five Percent (85%) of the highest selling price (regular way) per share of Common Stock of BRUNSWICK on the New York Stock Exchange on the day of the granting of such option.

5. SHERIDAN agrees fully and promptly to disclose to the officials of CATHETER and BRUNSWICK and their attorneys, all inventions and improvements made or conceived by him solely or jointly with other employees of CATHETER or BRUNSWICK while in the employ of CATHETER or BRUNSWICK, along the lines of CATHETER's present business or any line of activity which CATHETER later may engage in or investigate with a view of going into that business, or along the lines of the business or activities of BRUNSWICK and its divisions or other affiliates. SHERIDAN further agrees that he will assist CATHETER or BRUNSWICK and their nominees in every proper way, entirely at their expense, to obtain and maintain for its or their own benefit, patents for such inventions and improvements in any and all

countries, and that he will execute all papers and perform all other lawful acts necessary or advisable for filing and prosecuting patent applications and obtaining patents, and for the transfer of any and all interest therein to CATHETER or BRUNSWICK. CATHETER and BRUNSWICK agree that any inventions or improvements along lines not connected with their business and along lines which they have no desire or intention to investigate or enter, and which may be made on SHERIDAN's own time without expense to CATHETER or BRUNSWICK, shall remain SHERIDAN's property.

6. SHERIDAN agrees that he will not, without written approval by BRUNSWICK, publish or disclose to others than BRUNSWICK or authorize anyone else to publish or disclose, either during his term of employment or subsequent thereto, any technical know-how, data, or other information, relating to inventions, improvements, secret processes and formulas made or acquired in the course of his employment under this Agreement, or any confidential information acquired concerning BRUNSWICK's business.

7. During his employment by CATHETER or BRUNSWICK, SHERIDAN agrees that he will not engage in any activities directly or through any other corporation or organization

competing with the business of CATHETER or BRUNSWICK. This restriction shall be binding upon SHERIDAN for a term of five (5) years after February 19, 1974, if the Agreement is not terminated by CATHETER or BRUNSWICK prior thereto.

8. In the event of SHERIDAN's death or total incapacity prior to the end of the term of this Agreement, his salary shall cease.

9. In the event CATHETER or BRUNSWICK terminates this Agreement by notice prior to February 19, 1974, SHERIDAN agrees that he will not infringe any of the U.S. or foreign patents then owned by CATHETER or BRUNSWICK or which are licensed to CATHETER or BRUNSWICK by SHERIDAN, but CATHETER and BRUNSWICK agree that SHERIDAN shall be otherwise free to compete with CATHETER.

10. In the event SHERIDAN terminates this Agreement by notice prior to February 19, 1974, SHERIDAN agrees that he will not infringe any of the U.S. or foreign patents then owned by CATHETER or BRUNSWICK or which are licensed to CATHETER or BRUNSWICK by SHERIDAN. SHERIDAN further agrees that he will not enter into or in any way take part in a business in competition with CATHETER or BRUNSWICK so long

as any license agreement under SHERIDAN patents remains in effect between SHERIDAN and CATHETER or BRUNSWICK.

11. If the business of CATHETER is taken over by a division of BRUNSWICK, then CATHETER's rights and obligations hereunder shall be the rights and obligations of BRUNSWICK.

12. Any notices given hereunder shall be deemed to have been properly served upon and received by the party to whom addressed if they are sent United States registered mail, postage prepaid, and addressed as follows:

David S. Sheridan
P. O. Box 147
Argyle, New York

Sheridan Catheter & Instrument Corp.
Argyle
New York

The Brunswick-Balke-Collender Company
623 South Wabash Avenue
Chicago 5, Illinois

Any of the foregoing parties may change its address above given by a notice to such effect, sent to the other parties in the manner specified above.

IN WITNESS WHEREOF, SHERIDAN has set his hand and seal and CATHETER and BRUNSWICK have caused these presents to be

executed by their duly authorized officers all as of the day and year first above written.

David S. Sheridan (SEAL)
David S. Sheridan

SHERIDAN CATHETER & INSTRUMENT CORP.

By David S. Sheridan

THE BRUNSWICK-BALKE-COLLENDER COMPANY

By _____
Vice President

S T O C K O P T I O N

This Option, granted this _____ by THE BRUNSWICK-BALKE-COLLENDER COMPANY, a Delaware corporation (hereinafter called the "Company"), to _____, an employee of _____, a subsidiary of the Company (hereinafter called the "Employee"),

W I T N E S S E T H:

The object of this Option is to provide a means to permit the Employee to acquire shares of Common Stock without par value (hereinafter referred to as "Common Stock"), of the Company pursuant to an option which qualifies as a restricted option under Section 421 of the Federal Internal Revenue Code of 1954, and for the purposes and considerations set forth in the Plan adopted by the Board of Directors of the Company on November 2, 1954.

NOW, THEREFORE, the Company hereby grants to the Employee an option (hereinafter called the "Option"), to purchase, from time to time, all or any part of a total of _____ shares of Common Stock during a period commencing one year after the date of this Option and ending _____ (hereinafter called the "Option Period"), upon and subject to the following terms and conditions:

1. For any shares of Common Stock purchased at any time during the Option Period the Employee shall pay to the Company _____ per share (hereinafter called the "Option Purchase Price").

2. The Option may be exercised, subject to provisions herein relative to its termination and to the provisions of Section 3 hereof, only within the Option Period and only (a) by notices in writing of intent to exercise the Option, each of which notices shall state the number of shares in respect of which the Option is exercised, delivered to the Treasurer of the Company or mailed by registered mail addressed to the Company at its offices, 623-633 South Wabash Avenue, Chicago, Illinois, from time to time, until said total of _____ shares has been purchased, (b) by payment to the Company of the Option Purchase Price of the number of shares in respect of which the Option is exercised by certified check payable to the order of the Company contemporaneously with its receipt of each such notice and (c) if the Company shall so require, by delivery to the Company at the time of the delivery of such notice of a written statement of the person exercising the Option to the effect that shares received on the exercise of the Option are being acquired for investment and with no present view to the distribution thereof.

3. The Option is subject to the following limitations upon

(a) No shares may be acquired during the first year of the Option.

(b) At the commencement of each of the four years immediately following the first year of the Option, the right to purchase 25% of the total number of shares specified in the Option shall accrue to the Employee. Each such right to purchase such 25% may be exercised, in whole or in part, at any time after such right accrues.

4. The Option is not transferable by the Employee, otherwise than by will or the laws of descent and distribution, and may be exercised, during the lifetime of the Employee, only by him.

5. The Option shall terminate on the earlier to occur of _____ or three months after the cessation of the Employee's employment for any cause, including retirement, unless such cessation was occasioned by the death of the Employee, and if exercised after such cessation of employment may be exercised only in respect of the number of shares which the Employee could have acquired under the Option by the exercise thereof immediately prior to such cessation of employment. In case the employment of the Employee shall have ceased by reason of his death, the Option shall terminate on the earlier to occur of _____ or one year after such death, and if exercised after such death may be exercised only in respect of the number of shares which the Employee could have acquired under the Option by exercise thereof immediately prior to his death.

6. In the event that each of the outstanding shares of Common Stock of the Company (other than shares held by dissenting stockholders) shall be changed into or exchanged for a different number or kind of shares of stock or other securities of the Company or of another corporation (whether by reason of merger, consolidation, recapitalization, reclassification, split-up, combination of shares, or otherwise), then there shall be substituted for each share of Common Stock of the Company then subject to the Option the number and kind of shares of stock or other securities into which each outstanding share of Common Stock of the Company (other than shares held by dissenting stockholders) shall be so changed or for which each such share shall be so exchanged. For the purposes of this Section 6 a dividend declared after _____ payable in Shares of Common Stock shall be deemed to be a split-up.

In the event there shall be any other change in the number or kind of issued shares of Common Stock of the Company, or of any stock or other securities into which such Common Stock shall have been changed, or for which it shall have been exchanged, then if the Board of Directors of the Company shall, in its sole discretion, determine that such change equitably requires an adjustment in the number, or kind, or the Option Purchase Price of shares then subject to the Option, such adjustment shall be made by the Board of Directors of the Company and shall be effective and binding on the Employee for all purposes of the

7. If at any time during the Option Period the Company shall be advised by its counsel that the shares deliverable upon an exercise of the Option are required to be registered under the Federal Securities Act of 1933 or that delivery of such shares must be accompanied or preceded by a Prospectus meeting the requirements of such Act, the Company will use its best efforts to effect such registration or provide such Prospectus not later than a reasonable time following each exercise of the Option, but delivery of shares by the Company may be deferred until such registration is effected or such Prospectus is available.

IN WITNESS WHEREOF, the Company has executed this Option on the day and year first above written.

THE BRUNSWICK-BALKE-COLLENDER COMPANY

By _____
President

Exhibit 6

Departmental Communication Blank A.S.ALOE COMPANY

Mr. H. F. Baer FROM J. N. Willman DATE 1-26-7

SUBJECT SHERIDAN CATHETER & INSTRUMENT CORPORATION

Dear Howard:

Although, in our telephone conversation of January 25th, I gave you the highlights, and important features, of the deal that we negotiated with Dave Sheridan, at Brunswick's offices in Chicago on January 21st and 22nd, with the thought that you will be interested in considerably more details, here is what transpired.

Brunswick-Aloe was represented by Ken Griffin, Axel A. Hofgren (Brunswick's patent attorney) and myself.

Dave Sheridan was present, of course, and was assisted in the negotiations by his attorney from Washington, D. C., Carroll Palmer.

Our negotiations began at 9:00 a.m. Thursday, January 21st, continued throughout the day and through dinner until about 1:00 a.m. Friday. We began again at 9:00 a.m. Friday, January 22nd, and concluded the negotiation at around 4:30 p.m. that day.

First of all, for the record, I want to say that Ken Griffin's and Mr. Hofgren's assistance during the negotiations was outstandingly fine.

As you know, our negotiations concerned Plan A, which is the option that Dave Sheridan elected to take.

As a result of our negotiations with Sheridan there will be five separate contracts that will be drawn, for signature by Sheridan and Brunswick, as follows.

(1) Purchase Contract.

(2) Licensing Contract.

(3) Employment Contract.

(4) Lease Agreement.

(5) Land Option Contract.

I will discuss each of these agreements in the following, but I want to emphasize that, in my opinion, one of the most important things accomplished was the separation of our license to use Sheridan's patents from his employment contract, into two separate agreements.

Here are the salient features of each contract.

PURCHASE CONTRACT

We are purchasing the Sheridan Catheter and Instrument Corporation's physical assets and inventory with Brunswick Common Stock (price set at 47-3/4 per share.....the closing price on the New York Stock Exchange on January 5th, the date on which Brunswick's Board approved the purchase), on the basis of the replacement value of his physical assets plus the cost value of his inventory times two and one-half.

In addition, we are purchasing his net cash assets on a dollar for dollar basis with Brunswick Common Stock pegged at a price of 47-3/4 per share.

Sheridan represents his physical assets and inventory to be worth approximately $60,000, on the basis of the foregoing premises at the present time. However, he has agreed to a maximum figure of $55,000 for these assets, and this figure to be subject to our appraisal, should we elect to make an appraisal. Also, he has agreed that his inventory of raw materials, which is included in the foregoing figure, will be fixed at a figure of $7,500. If, on appraisal, his physical assets plus inventory (pegged at $7,500) run out at less than $55,000, the purchase price will be based on the lower price.

On the assumption that his physical assets and inventory will equal or exceed $55,000, our actual purchase price, in Brunswick's shares at 47-3/4, will be $137,500.

It is estimated that his net cash in the business, at time of closing, will approximate $60,000, which will be purchased from him, on a dollar for dollar basis, with Brunswick's shares at 47-3/4.

LICENSING CONTRACT

This contract will provide that we will have the exclusive right to the use of Sheridan's patents for the life thereof with our having the option to terminate the licensing agreement, on serving notice to Sheridan of our desire to terminate twelve months in advance of the first five years of the licensing agreement. If we do not serve such notice, the agreement will

automatically renew itself for another five years, and if, at the end of that second five year term we have not served notice to terminate, the agreement will automatically renew itself for another additional five years, and so on.

Our license to use Sheridan's patents is not limited to the medico-surgical field, but we may use these patents in any field in which they are applicable.

On the production of devices by the Sheridan Catheter & Instrument Corporation we will pay the following royalty rates, and on the following basis.

Four per cent (4%) on the first $500,000.00 of sales annually;

Three per cent (3%) on the second $500,000.00 of sales annually;

Two per cent (2%) on annual sales in excess of $1,000,000.00.

The prices on which the above rates are to be applied to determine the royalties are:

(A) On products manufactured by Sheridan Catheter and Instrument Corporation - Seventy per cent (70%) of BRUNSWICK'S lowest list retail price for the product or, at the option of BRUNSWICK, the actual "net sales" by BRUNSWICK except for sales to wholesalers.

(B) On products not manufactured by Sheridan Catheter and Instrument Corporation - the actual "net sales".

On any sub-licenses that we may grant to firms within the United States, we will pay the foregoing royalty rates to Sheridan, on the foregoing basis, but sub-licensees' sales will be lumped with ours to determine whether or not Sheridan is entitled to 4%, 3% or 2%.

In the case of foreign sub-licensees, we will have the right to negotiate any royalty rate we want to, with such foreign sub-licensees, and we will share the revenue from such foreign sub-licenses with Sherican on a 50-50 basis.

On the occasion of Sheridan's death we will pay royalties to his heirs, for the remaining life of any patent, on the use of the patent only. We will not pay royalties to his heirs on the use of his trade secrets or his know-how.

We will not pay any royalties to Sheridan on any sub-contracting that we permit him to do, such as the finishing of tips and eyes for the Becton-Dickinson Company that he is now doing.

During Sheridan's lifetime we will pay him royalties, on the basis of the foregoing schedule, on the total production of the plant, at Argyle, New York, less sub-contracting he does on such things as eyes and tips for others. In other words, during his lifetime, we will pay him royalties on not only the use of his patents, but also on the use of his trade secrets and know-how.

If for any reason we deem it necessary to enter into litigation to defend Sheridan's patents, or to prosecute infringers, we will do this solely at our expense, however, we do not have to litigate unless we want to.

Any future patents that result from Sheridan's effort alone, or his effort in concert with other Brunswick employees will be subject to royalty payments to Sheridan.

Sheridan will be guaranteed minimum royalties of $20,000 a year for five years. In other words, he will be guaranteed royalties until a total of $100,000 has been paid him. Thereafter he will simply get the royalties that he is entitled to. By this I mean that after five years, if sales are not up over $500,000 annually, the annual guarantee feature will expire.

EMPLOYMENT CONTRACT

We have agreed to a five year employment contract with Sheridan, with the right to renew from year to year thereafter, and subject to termination by us at the end of the first five year term, provided we serve notice on Sheridan to the effect that we desire to terminate six months ahead of the end of the five year term, and subject to termination by us from year to year thereafter, on six months notice to Sheridan.

Under this employment contract, Sheridan is to receive a salary of $22,500, and a stock option on 4,200 Brunswick shares to be granted him at the time of takeover, at 85% of the then prevailing market price, and subject to all of the provisions and restrictions in the Brunswick stock option plan.

Sheridan will become head of the Sheridan Catheter and Instrument Corporation (we have decided to retain the corporate form for the time being). By head of the operation, we construe this to mean that he will be the Vice President and General Manager, and that you will in all probability be President, and others of us here should be elected Vice Presidents, etc.

Sheridan is to devote his entire time and effort to the business, and will be subject to mandatory retirement at age 65, in accordance with Brunswick's policy.

Should we elect to terminate Sheridan's employment on the occasion of any one of the intervals that we are permitted this right, we will retain exclusive license to use his patents, of course, but he will have the right to go into the catheter business, if he cares to do so, in competition with us, and use his trade secrets and know-how. If, on the other hand, Sheridan elects to terminate his employment, he will not be permitted to use any of his trade secrets or know-how to compete with us.

LEASE AGREEMENT

We will lease Sheridan's factory building, at Argyle, New York, for a five year term at $150 (gross) per month, said lease being subject to cancellation by us at any time on 90 days' notice to Sheridan. This cancellation provision is in there in the event that we need to build a larger building, or in the event we need to transfer the operation to some other city, for any particular reason of our own.

Mr. H. F. Baer - 6 January 26th, 1960

LAND OPTION CONTRACT

This contract will cover an option for us to purchase 10 acres of Sheridan's farm, at a price of $100 per acre. The purpose of this option is to provide us with land in Argyle on which to build a larger plant if, and when, we feel we need it. This land will be land adjoining the highway (paved road) that runs in front of Sheridan's farm.

Howard, I think that I have given you a recital of all the important aspects of the agreement reached with Dave Sheridan in Chicago last week.

Ken Griffin and Mr. Hofgren are in the process now of drawing the necessary contract documents for signature by us and Sheridan.

We have stipulated that February 19th , 1960 will be the date of closing.

Attached to your copy of this letter is a photostat of Sheridan's balance sheet and profit and loss statement for the 8 month period ending November 30, 1959. I am sure that you will agree, on review of this financial data, that this has been a mighty profitable little operation, and I can see no reason why it won't become more so when we take it over and expand its volume.

Sincerely,

J. N. Willman

JNW:bjg
Enclosure

cc Mr. K. P. Griffin - Brunswick
Mr. L. T. Peifer - Brunswick
Mr. J. S. Riordan
Mr. K. A. Marshall

Exhibit 9

S E T T L E M E N T A G R E E M E N T

THIS AGREEMENT entered into this 28th day of May, 1971, among BRUNSWICK CORPORATION, a Delaware corporation having its principal place of business in Chicago, Illinois (hereinafter referred to as "Brunswick"), SHERWOOD MEDICAL INDUSTRIES, INC., a Delaware corporation having its principal place of business in St. Louis, Missouri ("Sherwood"), DAVID S. SHERIDAN, North Argyle, New York ("Sheridan"), and NATIONAL CATHETER CORPORATION, a New York corporation having its principal place of business in North Argyle, New York ("National Catheter").

WHEREAS, Sheridan and Brunswick were parties to agreements which, inter alia, included a license agreement dated March 10, 1960 (which, including amendments to the date hereof, is hereinafter referred to as a "License Agreement") providing for the licensing to Brunswick of certain patents owned by Sheridan and an employment agreement dated February 26, 1960 ("Employment Agreement") providing for the employment of Sheridan by Sheridan Catheter & Instrument Corporation, which corporation subsequently was merged into Brunswick; and

WHEREAS, controversies have arisen between Brunswick and Sherwood on the one hand, and Sheridan and National on the other, concerning the aforesaid Agreements and certain of these controversies are the subjects of litigation in a case styled Brunswick Corporation, et al. v. David S. Sheridan, et al., currently pending as Civil Action No. 68-CV-25 in the

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United States District Court for the Northern District of New York, in which Brunswick and Sherwood are plaintiffs, and Sheridan and National Catheter are defendants and counterclaimants; and

WHEREAS, all parties desire to settle the above-mentioned controversies and to terminate the aforesaid litigation.

NOW THEREFORE, the parties hereto mutually covenant and agree as follows:

1. All parties hereto shall execute a stipulation dismissing with prejudice all claims and issues of Civil Action No. 68-CV-25, and do hereby mutually release each other from all claims, demands, losses, expenses and causes of action asserted in or arising out of that litigation.

2. The parties recognize the continued validity of the License Agreement and such License Agreement shall continue in effect.

3. The Employment Agreement shall be considered terminated as of October 9, 1967, and from that date Sheridan shall not be bound by the provisions of numbered paragraphs 5, 6, 7 and 10 of that Agreement; provided, however, that Sheridan shall continue to be subject to the provisions of numbered paragraphs 4, 5 and 6 of this agreement.

4. Sheridan and National Catheter agree that they will not manufacture, or have manufactured, use, sell or otherwise deal in any products, or practice any method or process, so as to infringe any claim of any unexpired patent which is the subject of the License Agreement or any unexpired patent which issues from any application

for any invention which Sheridan conceived, alone or with others, during the period of his employment by Sheridan Catheter & Instrument Corp. or Brunswick and which has already been assigned by Sheridan under paragraph 5 of the Employment Agreement or will be assigned under the obligations of paragraph 6 of this agreement.

5. For a period of five years from the date hereof, neither Sheridan nor National Catheter shall, directly or indirectly, whether as owner, employee, officer, director, advisor or in any other capacity, do any of the following, nor assist or enable (whether by sale of an invention or otherwise) any person, corporation or other business entity to do any of the following:

(a) manufacture, or have manufactured, disposable needles, metal cannulae or hypodermic syringes and component parts thereof; or

(b) /manufacture, have manufactured, use, sell or otherwise deal in flexible tubing/made by any process in which the wall thickness of the tubing or the inner and/or outer diameters of the tubing is/are controlled so as to incorporate the features or configuration of an integral bubble or funnel similar to those manufactured by Sherwood as of February 1969, or/incorporating features or configuration of an x-ray or conductive line similar to the products manufactured by Sherwood as of February 1969./

6. Sheridan shall not, without written approval by Brunswick or Sherwood, publish or in any way disclose any Brunswick or Sherwood trade secrets disclosed to Sheridan during his employment by or his confidential relationship to Brunswick.

Sheridan further agrees that he will assist Brunswick or Sherwood and their employees, agents and attorneys in every proper way, at the expense of Brunswick or Sherwood, to obtain and maintain for their use and benefit, patents for any inventions and improvements disclosed in patent application numbers 843863 and 843866 and any prior patents or applications already assigned in any and all countries, and he will execute all documents and perform all other lawful acts necessary or advisable for filing and prosecuting patent applications and obtaining patents and for the transfer to Sherwood or Brunswick or their nominees of any and all interest that Sheridan may have in such patents for such inventions or improvements.

7. Sheridan acknowledges that Sherwood and its present or future subsidiaries, as subsidiaries of Brunswick, have the right to use processes and make, use, or sell products under the License Agreement subject to the obligations contained in the License Agreement.

8. Brunswick and Sherwood agree that no trade secrets of plaintiffs Brunswick or Sherwood are disclosed in Sheridan or Sheridan and Jackson patent application numbers 800547, 803258, 812102, 814061, 797512, 859413, 19230, and 33374, as filed.

9. With respect to patent application number 860278, as filed, defendants National Catheter and Sheridan agree that they will forthwith cause to be cancelled the substance of claims 1, 2 and 15 of application number 860278.

10. Any defense that Brunswick or Sherwood may have in the event of any suit charging infringement of any claim of any of the patent

applications identified in paragraphs 8 and 9 above is not waived.

11. Sherwood agrees to pay Sheridan the sum of One hundred thousand dollars ($100,000) as additional consideration and Brunswick and Sherwood agree that all royalties under the License Agreement which were held in trust pending the resolution of Civil Action No. 68-CV-25 shall immediately become the sole property of Sheridan.

12. It is expressly understood that this agreement shall bind and inure to the benefit of any heirs, successors or assigns of the parties hereto. This agreement embodies the entire understanding of the parties and no understanding or agreements, written or oral, in relation to the subject matter of this agreement exist except as expressly set forth herein. No change or modification of this agreement shall be valid unless made in writing and signed by all parties hereto.

IN WITNESS WHEREOF the parties hereto have put their hands and seals as of the date first written above.

BRUNSWICK CORPORATION

Attest: _____ By _____

SHERWOOD MEDICAL INDUSTRIES, INC.

Attest: _____ By _____

NATIONAL CATHETER CORPORATION

Attest: _____ By _____

Witness: _____

_____
DAVID S. SHERIDAN

11. NCC 6' conductive line tubing

Exhibit 12

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JOHN N. WILLMAN
PRESIDENT

April 27, 1972

Mr. Christian G. Schmidt
Executive Vice President
American Hospital Supply Corporation
McGaw Park, Illinois 6008;

Dear Dutch:

I am sending you, herewith, a sample of our conductive line tubing, so that you will be able to understand our contention that it is "similar" to the one Sheridan is producing.

Cordially,

J. N. Willman

JNW:ph

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Exhibit 13

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MEDICAL INDUSTRIES

JOHN N. WILLMAN
PRESIDENT

RECEI
MAY 1
SCHM

April 27, 1972

Mr. Christian C. Schmidt
Executive Vice President
American Hospital Supply Corporation
McGaw Park, Illinois 60085

Dear Dutch:

In follow up to our telephone conversation this morning, I send you, herewith, a copy of our Settlement Agreement of May 1971, with National Catheter Corporation and David S. Sheridan.

After your counsel has had a chance to review it, I will appreciate hearing from you.

Meanwhile, I thoroughly enjoyed our visit.

My best to you.

Sincerely,

J. N. Willman

JNW:ph

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NFPA
56A

STANDARD FOR THE USE OF
INHALATION
ANESTHETICS
1978

Official NFPA Definitions

APPROVED: means "acceptable to the authority having jurisdiction."

NOTE: The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment or materials nor does it approve or evaluate testing laboratories.

In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of nationally recognized testing laboratories, inspection agencies, or other organizations concerned with product evaluations which are in a position to determine compliance with appropriate standards for the current production of listed items, and the satisfactory performance of such equipment or materials in actual usage.

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NOTE: The phrase "authority having jurisdiction" is used in NFPA standards in a broad manner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local, or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his delegated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

LABELED: Equipment or materials to which has been attached a label, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling is indicated compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

LISTED: Equipment or materials included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each testing laboratory, inspection agency or other organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

SHALL: is intended to indicate requirements.

SHOULD: is intended to indicate recommendations or that which is advised but not required.

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Standard for the Use of

Inhalation Anesthetics

(Flammable and Nonflammable)

NFPA No. 56A — 1973

1973 Edition of No. 56A

This edition of NFPA No. 56A was prepared by the Sectional Committee on Anesthetizing Agents and approved by the Committee on Hospitals. It was adopted in May 1973 and supersedes the 1972 edition. In addition to editorial changes and minor revisions, the material has been completely rearranged into a more logical order.

Origin and Development of No. 56A

The original edition of No. 56 was in the form of an advisory pamphlet entitled "Combustible Anesthetics in Hospital Operating Rooms." In 1951 this was expanded and became "Safe Practices for Hospital Operating Rooms," and in 1962 it was renamed "Use of Flammable Anesthetics."

In 1970 it was expanded to include the use of nonflammable as well as flammable anesthetics. Other changes included the requirement for a dynamic line isolation monitor, special grounding procedures, and the revision of electrical safeguards to mitigate the hazard of electric shock in anesthetizing locations. The number was changed to No. 56A, and the title was changed to "Use of Inhalation Anesthetics." In 1971 amendments included requirements for the equipotential grounding system, and the introduction of new designs for plugs and receptacles for use with the isolated power system. The 1972 edition included changes in testing requirements for antistatic materials, clarification of requirements for the Line Isolation Monitor, additional definitions, and new appendix material.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

Interpretation Procedure of the Committee on Hospitals

Those desiring an interpretation shall supply the Chairman with five identical copies of a statement in which shall appear specific reference to a single problem, paragraph, or section. Such a statement shall be on the business stationery of the inquirer and shall be duly signed.

When applications involve actual field situations they shall so state and all parties involved shall be named.

The Interpretations Committee will reserve the prerogative to refuse consideration of any application that refers specifically to proprietary items of equipment or devices. Generally inquiries should be confined to interpretation of the literal text or the intent thereof.

Requests for interpretations should be addressed to the National Fire Protection Association, 470 Atlantic Ave., Boston, Mass. 02210.

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NOTICE

An asterisk (*) preceding the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Standard for the Use of

Inhalation Anesthetics (Flammable and Nonflammable)

NFPA No. 56A — 1973

Part I

Scope, History, Foreword, Organization and Definitions

11. History.

1111. When this standard was first published in 1941 the majority of inhalation anesthetics were administered with flammable agents, and fires and explosions in operating rooms occurred with disturbing frequency. Promulgation of this standard by the NFPA and the use of this standard by hospitals has lowered the incidence of such tragedies significantly.

1112. Nonflammable inhalation anesthetics possessing relatively safe properties were developed during the 1950's. The increasing use of these agents has curtailed and in some institutions almost completely eliminated the use of flammable agents. This change in anesthetic practice has made it desirable to delineate standards of construction and operation of rooms in locations where flammable agents never will be used. *It must be emphasized that many safety recommendations pertain to hazards other than those related to fires and explosions, e.g., electric shock. It must also be recognized that these newer agents may possess toxicologic hazards to patients and personnel* (See A3111).

12. Scope.

1211. This standard states the composite methods whereby the hazards of fire, explosion, and electric shock attending the use of inhalation anesthetics may be reduced. It also specifies the design and procedures for operating rooms in which flammable agents shall not be used, the composite methods whereby the hazards of electric shock from power and lighting circuits may be mitigated, and also delineates safeguards in the use of compressed gases.

1212. Electric shock and compressed gas hazards exist, irrespective of whether the facility is designed for use of flammable agents or for the exclusive use of nonflammable agents.

1213. This standard is intended to provide requirements to protect against explosions or fires, electric shock, mechanical injury from compressed gases or compressed gas cylinders, or anoxia from erroneous gas connections, without unduly limiting the activities of the surgeon or anesthesiologist.

1214. This principle, without minimizing any of the aforementioned dangers, recognizes that the physicians shall be guided by all the hazards to life that are inherent to surgical procedures carried out in anesthetizing locations.

1215. While the text of the standard occasionally uses the word "hospital" and refers to physicians and to other personnel and organizations commonly associated with general hospitals, its requirements are intended to apply to any facility in which inhalation mixtures are administered as anesthetics, including animal facilities.

1216. The provisions of this standard do not apply to manufacture or to storage, transportation or handling prior to delivery to the consuming facility. They do not apply to any use other than in an anesthetizing location.

1217. Although neither nitrous oxide nor oxygen will burn, both support combustion quite readily and pose a potential fire hazard even when flammable agents are not employed concurrently. Additionally, cylinders containing these gases pose a threat to life, because of the large amount of pneumatic energy contained therein, and the danger of accidental cross connection between supplies of nitrous oxide and oxygen.

13. Foreword.

1311. This standard has been formulated in the belief that, although materials and mechanical equipment must be relied upon to the fullest possible extent for the mitigation of fire, explosion, and electric shock hazards, such physical safeguards are most effective only when augmented by safety precautions conscientiously applied by operating room and supporting personnel. This standard emphatically calls attention to the need for constant human diligence in the maintenance of safe practices, because of the peculiar intermixing of flammable anesthetic hazards and electric shock hazards, together with the mental strain in the environment of surgical operations.

1312. Studies of these operating room hazards by many investigators over more than 30 years have pointed to the conclusion that the greatest degree of safety possible within the limitations of

our present knowledge is secured only through a completely coordinated program rather than by the application of individual and unrelated safeguards. Compliance with certain of the requirements of this standard will be effective, or even permissible, only when accompanied by compliance with the full program of precautionary measures.

1313. It is necessary that all personnel having any responsibility for safety in anesthesia collaborate in the precautionary program. In the case of hospitals, this will apply to members of the governing body, physicians, administrative personnel, nursing staff, and maintenance staff. Not only must such personnel achieve an understanding of the hazards involved, but in addition they must be reminded periodically of the dangers posed by electric shock, compressed gases and their cylinders, the explosive nature of all flammable agents, and the hazards created by oxygen-enriched atmospheres. (See *Fire Hazards in Oxygen Enriched Atmospheres*, NFPA 53M).

1314. A serious potential hazard exists in a "mixed facility," i.e., one in which some rooms are designed for the use of flammable agents and other rooms where flammable agents are prohibited. In the latter situation, inadvertent use of a flammable agent in the "nonflammable" room could be disastrous. It is important to understand the Regulations in Appendix B.

14. Organization.

1411. This standard is concerned with certain features of the construction and arrangement of operating rooms, delivery rooms, other anesthetizing locations, and ancillary facilities. This standard with equal emphasis, deals with the installation, maintenance, performance and use of equipment within anesthetizing locations, and ancillary facilities.

1412. This standard is divided into six parts, and contains six appendices:

Part I contains introductory material, including definitions which are referenced throughout the standard and apply to the interpretation and enforcement of requirements contained herein.

Part II delineates the hazards of fire, explosion, electric shock and the use of compressed gases.

Part III sets forth the standards for the construction, equipping, operation and maintenance of all anesthetizing locations, *flammable* and *nonflammable*, and rooms ancillary thereto.

Part IV states the standards, in addition to those of Part III, required for the construction, equipping, operation and mainte-

nance of flammable anesthetizing locations and flammable agent storage facilities.

Part V contains the standards, in addition to those contained in Part III, required for nonflammable anesthetizing locations.

Part VI lists the requirements particular to mixed facilities.

Appendix A, contains supporting material and deals with the background information explaining the reasons for many of the requirements.

Appendices B, C, D, E and F contain other informative material and *recommendations for safe practices.*

1413. The six parts of the standard and Appendix A are interdependent. For the informed development of an effective operating room safety program, it is necessary that thorough reference be made to all sections of these requirements.

1414. Requirements in this standard are intended as minimums. References to NFPA No. 70, *National Electrical Code* are to the applicable requirements contained in the 1971 edition.

15. Definitions.

***150.** The following definitions shall apply in the interpretation, implementation and enforcement of the provisions of this standard.

Alternate Power Source: One or more generator sets intended to provide power during the interruption of the normal electric service or the public utility electric service intended to provide power during interruption of service normally provided by the generating facilities on the premises.

Anesthetizing Location: Any area of a hospital in which it is intended to administer any flammable or nonflammable inhalation anesthetic agents in the course of examination or treatment, and shall include operating rooms, delivery rooms, emergency rooms, anesthesia rooms, corridors, utility rooms and other areas when for induction of anesthesia with flammable or nonflammable anesthetizing agents.

Antistatic: Adjective describing that class of materials, which includes conductive materials, and also those materials which throughout their stated life, when tested in accordance with 4663 and 4664 of this standard, exhibit a charge decay of 90 percent from an applied voltage of 5000 volts within ½ second, or a surface resistivity not exceeding 1×10^{11} ohms.

Automatic: Adjective describing a device which is self-acting, operating by its own mechanism when actuated by some impersonal

influence, as for example: a change in current strength, pressure, temperature, or mechanical configuration.

Combustible: Adjective describing a solid which will react with oxygen, if ignited, and burn.

Combustion, Products of: The gases, volatized liquids and solids, including particulate matter and ash, generated by the process of combustion.

Conductive: Adjective describing only those materials, such as metals, which are commonly considered as electrically conductive, but also to that class of materials which, when tested in accordance with this standard, have a resistance of not exceeding 1,000,000 ohms. Such materials are required where electrostatic interconnection is necessary.

Continuous Power Supply: An electric system, independent of the alternate source, which supplies power with minimum interruption (twelve cycles or less).

Critical Branch: A system of feeders and branch circuits connected to the alternate power source by one or more transfer switches and supplying energy to task illumination and selected receptacles serving areas and functions related to patient care.

Detonation: An exothermic reaction wherein the reaction propagates through the unreacted material at a rate exceeding the velocity of sound, hence the explosive noise.

Equipment Grounding Bus: A grounding terminal bus in the feeder circuit or a branch circuit electric distribution panel which serves a particular area.

Equipment System: A system of feeders and branch circuits arranged for delayed automatic or manual connection to the alternate power source and which serves primarily three-phase power equipment.

Essential Electric Systems for Hospitals: Systems comprised of alternate sources of power, transfer switches, overcurrent protection devices, distribution cabinets, feeders, branch circuits, motor controls, and all connected electric equipment, designed to assure designated areas and functions of a hospital continuity of electric service during disruption of normal power sources, and also designed to minimize the interruptive effects of disruption within the internal wiring system.

Fault Current: An electric current in an accidental connection to a live conductor resulting from a defect or failure in an electric system or appliance.

Flammable: Adjective describing any gas or liquid which will burn; capable, when ignited, of maintaining combustion under specified conditions.

Flammable Anesthetizing Location: Any operating room, delivery room, anesthesia room, emergency room, treatment room, corridor, utility room, and any other area if used or intended for the use of flammable anesthetizing agents.

Ground-Fault Circuit-Interrupter: A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Grounding: As used in this standard, refers primarily to the establishment of an equipotential system of conductors for stray currents in the vicinity of the patient.

Hazard Current: For a given set of connections in an isolated power system, the total current that would flow through a low impedance if it were connected between either isolated conductor and ground.

Fault Hazard Current: The hazard current of a given isolated system with all devices connected except the line isolation monitor.

Monitor Hazard Current: The hazard current of the line isolation monitor alone.

Total Hazard Current: The hazard current of a given isolated system with all devices, including the line isolation monitor, connected.

Hazardous Location in a Flammable Anesthetizing Location: The space extending five feet above the floor in a flammable anesthetizing location. (See 42.)

Isolated Power System: An assembly of electric devices including local isolated power, a line isolation monitor, distinctive receptacles and a single reference grounding point.

Isolation Transformer: A transformer of the multiple-winding type, with the primary and secondary windings physically separated, which inductively couples its secondary winding to the grounded feeder systems that energize its primary winding, thereby preventing primary circuit potential from being impressed on the secondary circuits.

Leakage Current: Any current, including capacitively coupled currents, not intended to be applied to a patient but which may be

conveyed from accessible parts of an appliance to ground or to other accessible parts of an appliance to ground or to other accessible parts of the appliance. Its measurement is described in 378.

Life Support Branch: A system of feeders and branch circuits, connected to the alternate power source by a transfer switch and functioning as a component of the emergency system. The operation of this branch may be necessary for patient survival, and therefore requires maximum protection against failure. Only isolated power systems may be connected to this branch.

Line Isolation Monitor: An instrument which continually checks the hazard current from an isolated circuit to ground.

Macroshock: The effect of large electric currents (milliamperes or larger) on the body.

Microshock: The effect of small electric currents (as low as 10 microamperes) on the body. To be hazardous, such currents must be applied to a conductor inside or in very close proximity to the heart.

Mixed Facility: A hospital wherein flammable anesthetizing locations and nonflammable anesthetizing locations coexist within the same building, allowing interchange of personnel or equipment between flammable and nonflammable anesthetizing locations.

Nitrous Oxide: An inorganic compound, one of the oxides of nitrogen; it exists as a gas at atmospheric pressure and temperature, possesses a sweetish smell and is capable of inducing the first and second stages of anesthesia when inhaled; the oxygen in the compound will be released under conditions of combustion, creating an oxygen enriched atmosphere.

Nonflammable Anesthetic Agent: As used in this standard, refers to those inhalation agents which, because of their vapor pressure at 37° C and at atmospheric pressure, cannot attain flammable concentrations when mixed with air, oxygen, or mixtures of oxygen and nitrous oxide.

Nonflammable Anesthetizing Location: Any operating room, delivery room, anesthesia induction room, emergency room, treatment room, corridor, utility room, and any other area permanently used for, or intended for the exclusive use of, nonflammable anesthetizing agents.

Oxygen: An element which, at atmospheric temperatures and pressures, exists as a colorless, odorless, tasteless gas; its outstanding property is its ability to sustain life and to support combustion; although oxygen is nonflammable, materials which burn in air

will burn much more vigorously and create higher temperatures in oxygen or in oxygen enriched atmospheres.

Oxygen Enriched Atmosphere: An atmosphere in which the oxygen content exceeds 21 percent by volume or 160 Torr (millimeters of mercury) partial pressure; the addition of nitrous oxide to an atmosphere will create an oxygen enriched atmosphere for the purposes of this standard.

Patient Ground: A terminal bus which serves as the single focus for grounding all electric devices serving an individual patient which are not connected by the power cord to the reference grounding point, and for grounding conductive furniture or equipment within reach of a patient or a person who may touch him.

Reference Grounding Point: A grounding terminal bus in the branch circuit electric distribution panel for circuits which serve a particular patient care area as the common grounding point. It may be the equipment grounding bus in a grounded distribution system.

Risk Class 1 Patient: Patients who have no intentional contact with electrodes; ambulatory patients, many bed patients with minimal contact with electrical appliances.

Risk Class 2 Patient: Patients, ambulatory and nonambulatory, subject to diagnostic or therapeutic procedures involving electrical appliances.

Risk Class 3 Patient: Patients with externalized conductors, diagnostic catheters, or other direct electric contact with the conduction system of the heart.

Room Ground: A terminal bus which serves as the single focus for grounding metal or conductive building surfaces in the room.

Storage Location for Flammable Anesthetics: Any room within a consuming facility (hospital) used for the storage of flammable anesthetic or flammable disinfecting agents (see *Flammable and Combustible Liquids Code*, NFPA No. 30) or inhalation anesthetic apparatus to which cylinders of flammable gases are attached. Such a storage location shall be considered a hazardous area throughout.

Torr: A unit of pressure, named after the Italian physicist Torricelli; one torr = 1 mm. Hg @ 1° C.

Part II

Nature of Hazards

21. General.

2111. The environment of the modern operating room poses numerous hazards, even in those rooms in which flammable agents are prohibited.

22. Hazards Present in All Anesthetizing Locations.

221. Electric Shock and Spark Hazards — High Frequency Burns.

2211. When a human body becomes the connecting link between two points of an electric system which are at different electric potentials, the person is likely to suffer an electric shock or high frequency burns. When there is a highly conductive pathway from outside the body to the heart or great vessels, small electric currents may cause ventricular fibrillation or cardiac arrest (see NFPA No. 76B-T, *Safe Use of Electricity in Hospitals*). If a conductive material bridges two points of an electric system which are at different electric potentials, the contact is likely to create a spark or an arc and intense heating of one or more of the conductors involved.

2212. Improper use of the high frequency electrosurgical unit, alone or in combination with certain items of medical monitoring equipment, may cause serious high frequency burns to the patient or to personnel. (See NFPA No. 76CM, *High Frequency Electrical Equipment in Hospitals.*)

222. Toxicologic Hazards.

2221. The use of some modern nonflammable inhalation anesthetic agents with high flow techniques and in the absence of venting of the exhaled gases to the atmosphere may create low grade toxicity in personnel who work regularly in the operating room (see Appendix A311).

223. Mechanical Hazards.

2231. A large amount of energy is stored in a cylinder of compressed gas. If the valve of a cylinder is struck (or strikes something else) hard enough to break off the valve, the contents of the cylinder may be discharged with sufficient force to impart dangerous reactive movement to the cylinder.

2232. A hazard exists when hospital personnel attempt to transfer the contents of one compressed gas cylinder into another.

23. Hazards Related to the Use of Flammable Substances.

231. Flammable Anesthetic Agents.

***2311.** The use of flammable anesthetic agents (see definition of Flammable and Appendix A2311) is attended by considerable fire and explosion risk because these agents form flammable mixtures with air, oxygen, or nitrous oxide. In many cases, these mixtures are violently explosive. Fatal accidents have resulted from explosions of such mixtures during anesthesia.

2312. The use of closed rebreathing systems for the administration of flammable anesthetic agents normally tends to restrict the region likely to be hazardous. To secure a reasonable measure of protection, however, it has been found necessary to apply certain basic safeguards in any room in which these agents may be used.

232. Flammable Medicaments, Including Aerosol Products

2321. Medicaments, including those dispersed as aerosols, frequently are used in anesthetizing locations for germicidal purposes, for affixing plastic surgical drape materials, for preparation of wound dressings, or for other purposes (see 3738(a)).

2322. A particular hazard is created if cautery or high frequency electrosurgical equipment is employed following use of a flammable medicament for preparation of the skin (see 2321) since the liquid remaining on the skin or vapors pocketed within the drapes may be ignited (see 3738(b) and (c)).

233. Sources of Ignition.

***2331.** Principal sources of ignition of flammable anesthetics in anesthetizing locations include the following: (a) fixed electric equipment, (b) portable electric equipment, (c) accumulation of static electricity, (d) electrosurgical equipment, (e) open flames and heated objects above the ignition temperature of the flammable gases in use. Additional sources of ignition may be percussion sparks, ignition of oxidizing and flammable gases from accidental mixing under pressure (see 3612), and ignition from improper handling of oxygen cylinders (see 3761). There is evidence indicating that fatal operating room accidents have occurred as a result of the violent rupture of anesthesia equipment due to the detonation of ether peroxides (see Appendix A2331).

2332. Experience indicates that the ignition of flammable mixtures by electrostatic spark is a great hazard. Electrostatic charges may accumulate on personnel and metallic equipment. Electrostatic charges can set up dangerous potential differences only when separated by materials which are electrically nonconducting. Such insulators act as barriers to the free movement of such charges, preventing the equalization of potential differences. A spark discharge can take place only when there is no other available path of greater conductivity by which this equalization may be effected (see 46). Such a spark may ignite a flammable mixture of gases.

2333. In the majority of cases a situation presenting one of these hazards (electric shock or electrostatic discharge) also presents the other. Safeguards against one of these hazards are often effective against the other. There are, however, situations in which the safeguards are conflicting; hence, it is necessary to consider both hazards in recommending precautionary measures for either (see 33, 34, 35, 43, 44, 45, and 46).

2334. An obvious and, hence, less frequent cause of the ignition of flammable anesthetic agents is by open flame or hot materials at or above the ignition temperature of the agents. The lowest ignition temperature in air of any of the anesthetic agents mentioned in 2311 is that of ethyl ether: 180° C (365° F). The most effective safeguard against this source of ignition is a constant vigilance on the part of the operating room personnel to prevent the introduction of sources of flames and hot objects into the anesthetizing locations (see 3739).

24. Hazards Which May Be Present in Nonflammable Anesthetizing Locations.

241. Electrostatic Hazard.

2411. Conductive flooring is not a requirement for nonflammable anesthetizing locations. The uncontrolled use of static-producing materials in such locations, however, may lead to:

(a) a hazardous electrostatic discharge to a conductor leading into the heart or great vessels of a patient;

(b) electrostatic discharge through sensitive components of electronic equipment, causing equipment failure;

(c) inadvertent use of these materials in flammable anesthetizing locations where mixed facilities exist (see 150);

(d) impaired efficiency because of electrostatic clinging; or

(e) the involuntary movement of personnel subject to electrostatic discharges.

242. Hazard of Flammable Substances.

2421. Nonflammable anesthetizing locations are neither designed nor equipped for the use of any flammable substances, be they inhalation anesthetic agents or medicaments containing benzene, acetone or the like. A hazardous situation is created any time any such flammable substance is inadvertently or intentionally introduced into a nonflammable anesthetizing location (see also 232).

25. Hazards Which May Be Present in Mixed Facilities.

2511. Mixed facilities (see 150) contain both flammable and nonflammable anesthetizing locations. Movable furniture, portable equipment and conductive accessories intended for sole use in nonflammable anesthetizing locations may be introduced inadvertently into a flammable anesthetizing location, with the attendant dangers of ignition of flammable gas mixtures from electrical or electrostatic sparks.

2512. Personnel working in mixed facilities may not take the proper precautions in reference to wearing apparel and the use of conductive grounding devices when entering flammable anesthetizing locations.

2513. A particular hazard exists if regulations (see Appendix B, set (3)) are not adopted, posted, and complied with (see 3733), or if the anesthetizing locations are not identified as noted in 5112 and 6131.

Part III

Requirements for All Facilities

31. Ventilation, Humidification and Cooling.

*311. Anesthetizing Locations.

3111. Relative humidity of not less than 50 percent, at a temperature range of 70° ± 5° F., shall be maintained in anesthetizing locations, both flammable and nonflammable.

3112. The required humidity shall be maintained within the anesthetizing locations by means of a mechanical ventilation system.

3113. Supply and exhaust systems for windowless anesthetizing locations shall be arranged to automatically vent smoke and products of combustion.

3113. Ventilating systems for anesthetizing locations shall be provided with automatically controlled dampers actuated by devices intended to sense smoke and products of combustion to, (a) prevent recirculation of smoke originating within the surgical suite and, (b) to prevent the circulation of smoke entering the system intake, without in either case interfering with the exhaust function of the system.

3115. The electric supply to the ventilating system shall be served by the equipment system of the essential electrical system specified in NFPA No. 76A, *Essential Electrical Systems for Hospitals.*

3116. Window-type temperature regulating units (air-conditioners) may be installed in exterior windows or exterior walls of anesthetizing locations (see also 4112 and 4113). Where such units are employed, the provisions of 3111 shall be met.

312. Storage Locations or Manifold Enclosures for Oxygen and Nitrous Oxide.

3121. Storage rooms or manifold enclosures for oxygen and nitrous oxide in excess of 2000 cubic feet manifold (or cylinder) capacity shall be vented to the outside.

NOTE: Storage rooms or manifold enclosures for oxygen and nitrous oxide of less than 2000 cubic feet manifold (or cylinder) capacity need not be vented to the outside.

3122. Sources of heat in storage locations shall be protected or located so that cylinders of compressed gases shall not be heated to the activation point of integral safety devices. In no case shall the temperature of the cylinders exceed 50° C (125° F). Care shall

be exercised in handling cylinders that have been exposed to freezing temperature to prevent injury to the skin.

32. Nonflammable Medical Gases.

321. Construction of Cylinder Storage or Manifold Enclosures.

3211. Separate cylinder storage or manifold enclosures shall be provided for oxidizing gases (nitrous oxide and oxygen) and for flammable gases. Such enclosures shall serve no other purpose. Such enclosures shall be constructed of an assembly of building materials with a fire resistance rating of at least one hour and shall not communicate directly with anesthetizing locations or each other.

NOTE 1: Conductive flooring is not required in cylinder storage locations which are not a part of a surgical or obstetrical suite.

NOTE 2: Conductive flooring is not required for those cylinder storage locations or manifold enclosures used only for nonflammable medical gases (see 4126).

3212. Provisions shall be made for racks or fastenings to protect cylinders from accidental damage or dislocation.

3213. The electric installation in storage locations or manifold enclosures for nonflammable medical gases shall comply with the standards of NFPA No. 70 for ordinary locations. Electric wall fixtures, switches and receptacles shall be installed in fixed locations not less than five feet above the floor as a precaution against their physical damage.

3214. Storage locations for oxygen and nitrous oxide shall be kept free of flammable materials (see also 3756).

322. Nonflammable Medical Gas Piping Systems.

3221. Oxygen and nitrous oxide manifolds and piping systems which supply anesthetizing locations shall comply with the *Standard for Nonflammable Medical Gas Systems*, NFPA No. 56F.

3222. The main supply line shall be provided with a shutoff valve so located as to be accessible in an emergency. This valve shall be identified.

3223. A shutoff valve shall be located outside each anesthetizing location in each oxygen or nitrous oxide line, so located as to be readily accessible at all times for use in an emergency. These valves shall be so arranged that shutting off the supply of gas to any one operating room or anesthetizing locations will not affect the others. Valves shall be of approved type, mounted on a pedestal

or otherwise properly safeguarded against physical damage and marked to prohibit tampering or inadvertent closing: such as, "Oxygen — Do Not Close."

Exception: This paragraph does not apply when provisions of 3224 are met.

3224. A shutoff valve located immediately outside anesthetizing locations, specified in 3223, is not required if service valves for oxygen and nitrous oxide are located within the anesthetizing locations and are equipped with pipes extending at least six feet and terminating with female members of noninterchangeable quick couplers for oxygen and nitrous oxide. The male member of quick couplers shall be attached to, (1) length of hose leading to yoke inserts suitable for oxygen or nitrous oxide on anesthesia machines or other dispensing equipment, or (2) lengths of hose leading to noninterchangeable quick couplers or specifically designed noninterchangeable threaded connections complying with CGA Pamphlet V-5, *Diameter Index Safety System* of the Compressed Gas Association, Inc.

***3225.** Each yoke insert shall be drilled with two holes of a size and in locations specified in the *Pin-Index Safety System*, ANSI Standard B57.1-1965 (Canadian Standard CSA-B96-1965) for the gas contained in the pipeline to which it is attached (see Appendix A3225).

3226. Each yoke insert or noninterchangeable quick coupler or specifically designed noninterchangeable threaded connection complying with the Diameter Index Safety System shall be equipped with a backflow check valve designed to prevent flow of gas from the anesthesia apparatus into the pipeline system. Each backflow check valve shall be designed to function properly at pressures up to 2700 psig.

3227. Cylinder valve outlet connections shall conform with American National Standard ANSI B57.1-1965 (see 3612 and Appendix A3225).

3228. Piping systems shall not be used for the distribution of flammable anesthetic gases.*

33. Electric Distribution.

331. Isolated Power Systems.

***3311.** A local ungrounded electric system shall be provided in each anesthetizing location. The purpose of this system shall be

*These requirements do not restrict the distribution of helium or other inert gases through piping systems.

to limit the role of grounded metal objects as return paths for electric currents.

NOTE: 1 The isolated system reduces the ignition hazard from arcs and sparks between a live conductor and grounded metal and mitigates the hazard of shock or burn from electric current flowing through the body to ground. The latter hazard usually follows inadvertent contact with one live conductor or results from unrecognized failure of insulation. An isolated power system also permits the use of a practicable equipotential grounding network to shunt leakage and fault currents harmlessly away from the body even though it is abnormally susceptible to electrocution as a result

NOTE 2: Such a system provides protection against spark and arc hazards in normal operation of electrical equipment, and from spark and electric shock hazards due to the most common types of insulation failure. It does not, however, prevent all electric sparks or completely eliminate the possibility of electric shock from insulation failure. Electric shock hazards are particularly aggravated in operating rooms because of the physiological predisposition to injury of persons in such locations and because of the generally low electric resistance resulting from moisture on the floors or the use of conductive shoes and the installation of conductive floors necessary for dissipation of static electricity. Patients and personnel often are wet with prepping solutions, blood, urine and other conductive fluids which greatly reduce resistance to the passage of unintended electrical current. Because a patient may be present with an in-dwelling probe, catheter or electrode in his heart or great vessels that electrically connect these organs to the external environment, provision is made for grounding metal surfaces within reach of the patient to a central grounding point. This prevents the patient's tissues from being a pathway for leakage current between grounded metal at disparate potentials. More than ordinary care is crucially necessary in the use and maintenance of all electric systems and equipment in storage and anesthetizing locations.

332. Isolation Transformer.

3321. The isolation transformer shall be approved for the purpose. The secondary winding shall be physically separated from the primary winding to prevent primary potential from being impressed on the secondary circuit.

3322. The primary winding shall be connected to a power source of not more than 300 volts (nominal). The neutral of the primary winding shall be grounded in an approved manner. If an electrostatic shield is present, it shall be connected to the reference grounding point (see 3357).

3323. The live conductor of the primary power supply shall have an approved overcurrent protective device.

3324. An isolation transformer shall not serve more than one room except as provided in 3333.

3325. The isolated system shall be two-wire, single phase. The secondary circuit conductors shall not be grounded and shall be provided with an approved overcurrent protective device in both conductors of every branch circuit. Voltage across the ungrounded circuit shall not exceed 300 volts.

3226. The line isolation monitor shall be considered to be on a branch circuit if it is mounted external to the isolated system distribution panel.

333. Impedance of Isolated Wiring.

3331. The impedance (capacitive and resistive) to ground of either conductor of an isolated system shall exceed 500,000 ohms when installed. The installation at this point may include receptacles, but not lighting fixtures or components of fixtures. This value shall be determined by energizing the system and connecting a low impedance ac milliammeter (0–1 mA scale) between the reference grounding point and either conductor in sequence. This test may be performed with the line isolation monitor (see 3341) connected, provided the connection between the line isolation monitor and the reference grounding point is open at the time of the test. After the test is made, the milliammeter shall be removed and the grounding connection of the line isolation monitor shall be restored. When the installation is completed, including permanently connected fixtures, the reading of the meter on the line isolation monitor, which corresponds to the unloaded line condition, shall be made. This meter reading shall be recorded as a reference for subsequent line impedance evaluation.

NOTE: The line isolation monitor meter reading includes the hazard current and therefore exceeds the milliammeter reading made during the line impedance test. It is desirable to limit the size of the isolation transformer to 10 KVA or less and to use conductor insulation with low leakage to meet the impedance requirements. Keeping branch circuits short, using insulation with a dielectric constant less than 3.5 and insulation resistance constant greater than 20,000 at 60° F, reduces leakage from line to ground.

3332. An approved capacitance suppressor may be used to improve the impedance of the permanently installed isolated system; however, the resistive impedance to ground of each isolated conductor of the system shall be at least one megohm *prior to the connection* of the suppression equipment. Capacitance suppressors shall be installed so as to prevent inadvertent disconnection during normal use.

3333. Isolation transformers may serve single receptacles in several patient areas when the receptacles are reserved for supplying power to equipment requiring 150 volts or higher, and to such

items as portable X-ray units and when the receptacles and mating plugs are not interchangeable with the receptacles on the local isolated power system.

3334. IDENTIFICATION OF CONDUCTORS FOR ISOLATED (UNGROUNDED) SYSTEMS.

(a) Requirements for the identification of conductors for isolated (ungrounded) systems are provided in this section. The colors shall be in accord with MIL 104A Class 1.

(b) Each ungrounded secondary conductor supplied by the isolated (ungrounded) secondary winding of an isolation transformer shall be identified by:

(1) Green-grounding conductor

(2) Orange-conductor No. 1

(3) Brown-conductor No. 2

334. Line Isolation Monitor.

3341. In addition to the usual control and protective devices, each isolated power system shall be provided with an approved continually operating line isolation monitor that indicates possible leakage or fault currents from either isolated conductor to ground.

3342. The monitor shall be designed so that a green signal lamp, conspicuously visible to persons in the anesthetizing location, remains lighted when the system is adequately isolated from ground; an adjacent red signal lamp and an audible warning signal (remote if desired) shall be energized when the total hazard current (consisting of possible resistive and capacitive leakage currents) from either isolated conductor to ground reaches a threshold value of two milliamperes under nominal line voltage conditions. The line isolation monitor is not to alarm for a fault hazard current of less than 0.7 milliamperes.

NOTE: A system may be designed to operate at a lower threshold value of total hazard current. A line isolation monitor for such a system may be approved with the provision that the fault hazard current may be reduced but not to less than 35 percent of the corresponding threshold value of the total hazard current, and the monitor hazard current is to be correspondingly reduced to no more than 50 percent of the alarm threshold value of the total hazard current. Such tightened systems contribute little additional electric safety, however, and are not recommended except for special applications.

3343. The line isolation monitor shall have sufficient internal impedance that when properly connected to the isolated system the maximum internal current that can flow through the line isolation

monitor, when any point of the isolated system is grounded, shall be one milliampere.

NOTE: It is desirable to reduce this monitor hazard current provided this reduction results in an increased "not alarm" threshold value for the fault hazard current.

3344. An ammeter calibrated in the total hazard current of the system (contribution of the fault hazard current plus monitor hazard current) shall be mounted in a plainly visible place on the line isolation monitor with the "alarm on" (total hazard current = two milliamperes) zone at approximately the center of the scale.

NOTE: The line isolation monitor may be a composite unit, with a sensing section cabled to a separate display panel section, on which the alarm and test functions are located, if the two sections are within the same electric enclosure.

It is desirable to locate the ammeter so that it is conspicuously visible to persons in the anesthetizing location.

3345. Means shall be provided for shutting off the audible alarm while leaving the red warning lamp activated. When the fault is corrected and the green signal lamp is reactivated, the audible alarm silencing circuit shall reset automatically, or an audible or distinctive visual signal shall indicate that the audible alarm is silenced.

3346. A reliable test switch shall be mounted on the line isolation monitor that will test its capability to operate (i.e., cause the alarms to operate and the meter to indicate in the "alarm on" zone). This switch shall transfer the grounding connection of the line isolation monitor from the reference grounding point to a test impedance arrangement connected across the isolated line, the test impedance(s) shall be of appropriate magnitude to produce a meter reading corresponding to a total hazard current of 2 milliamperes at the nominal line voltage. The operation of this switch shall break the grounding connection of the line isolation monitor to the reference grounding point before transferring this grounding connector to the test impedance(s), so that making this test will not add to the hazard of a system in actual use, nor will the test include the effect of the line to ground stray impedance of the system. The test switch shall be of a self-restoring type.

NOTE 1. A 120 volt (nominal) 60 Hz ac system of moderate ampacity is assumed for the description of the specification of the line isolation monitor in 3341. If other systems are considered, modification[t] are required, e.g., for other voltages or frequencies, installed impedance and sensitivity (alarm) levels differ.

NOTE 2. Protection for the Risk III patient is provided primarily by a centric grounding system. The ungrounded secondary of the isola-

tion transformer reduces the maximum current in the grounding system in case of a single fault between either isolated power conductor and ground. The line isolation monitor provides warning when a single fault occurs, or when excessively low impedance to ground develops, that may expose the patient to an unsafe condition should an additional fault occur. Excessive current in the grounding conductors will not result from a first fault. A hazard exists if a second fault occurs before the first fault is cleared.

3347. Hospitals complying with NFPA No. 56, prior to 1970, shall not be required to change ground fault detectors to a line isolation monitor with a one milliampere limitation on current through the line isolation monitor to ground under any fault condition external to the line isolation monitor.

335. Equipotential Grounding System.

3351. An equipotential grounding system shall be installed and maintained in each anesthetizing location to minimize the difference in potential which can occur between any conductive surfaces that the patient or a person touching the patient can contact. This potential difference, under conditions of the first fault between either isolated conductor and ground, shall be less than 5 millivolts.

3352. The purpose of the equipotential grounding network is to permit intermingling of electric appliances located near or applied to the patient without the hazard of leakage or fault current in the patient, particularly the heart.

3353. The equipotential grounding system shall consist of a set of conductors which centrically connect each conductive surface that is liable to patient contact to:

(a) [illegible]nt Ground, or a

(b) [illegible]om Ground, or ultimately to a

(c) Reference Grounding Point.

3354. These grounding points may be physically the same or separate. If separate, the patient ground and the room ground shall be connected to the reference grounding point by a separate identified No. 10 AWG copper insulated grounding conductor.

3355. A patient ground shall be provided and shall consist of an accessible, highly conductive, bare metal bar permanently mounted on the wall as near the head of the operating table as possible to provide a low impedance connection between large non-electrical metal equipment such as the operating table, anesthesia machine, and instrument tables with exposed metal that bridge the patient. The bar shall array six grounding jacks and provide terminals for conductors from jacks that may be located elsewhere

in the same room as the patient ground. A separate stranded insulated No. 12 AWG copper identified grounding wire no more than 15 feet long shall connect each remote jack to the patient ground.

NOTE: The patient ground is to assure that metal furniture and non-electric equipment within reach of the patient, or those who may touch him, are at a common potential. It is not intended to apply to devices such as bedpans and other small portable or mobile devices. Furniture that is draped is sufficiently insulated to preclude the need for grounding.

3356. A room ground shall be provided and shall consist of an accessible highly conductive bare metal bar arraying terminals for grounding all exposed metal building surfaces which may be within reach of a patient or which may be within reach of persons who may touch him; e.g., gas, suction, water, heating and drain pipes; conduits unrelated to the electric power distribution system; ducts; portable partitions, structural metal door or window frames. At least three spare terminals shall be provided. The room ground may be located inside or outside of the anesthetizing location.

NOTE: The room ground is intended to assure that all electrically conductive building surfaces within reach of a patient are at the same electric potential. Therefore, any metal building surface which might become electrically energized is to be connected to it.

(a) Items of building metal in proximity to each other may be bonded together in an approved manner for connection to the room ground.

(b) Insulation of small exposed metal surfaces is an equivalent protective measure.

3357. A reference ground point shall be provided for each secondary distribution system. It shall be a highly conductive bare metal bar located in the isolated branch circuit box and shall provide sufficient terminals to accommodate insulated grounding conductors to:

(a) each branch circuit

(b) electrostatic shield if present

(c) line isolation monitor

(d) each patient ground

(e) each room ground

(f) connect to nearest structural steel

(g) connect the reference grounding point to the equipment grounding bus in the electric distribution panel servicing the particular area. The latter is to be connected to the building service ground in conformity with the *National Electrical Code*, NFPA No. 70–1971, 250–91, 250–92, 250–95.

3358. A reference grounding point may serve more than one patient but no patient ground is to be served by more than one reference grounding point except as provided in 3361.

336. Grounding Interconnections for the Essential Electrical System.

3361. In anesthetizing locations supplied by both the life support and the critical branches of the essential electrical system, NFPA 76A-1971, *Essential Electrical Systems for Hospitals* the reference grounding point of the life support system is to be connected to the reference grounding point of the critical system serving the same anesthetizing location.

3362. The conductive floor, if installed, shall be connected to the room ground.

3363. Grounding of metal raceways shall be assured by means of provisions of grounding bushings on all conduit terminations at the panelboard, and by means of insulated continuous No. 12 AWG stranded copper grounding wire extended from the ground bus in the panelboard to the conduit grounding bushings.

3364. Grounding of metal switch and receptacle plates shall be provided by means of the mounting screw connections to the device mounting yokes.

3365. The operating table, the anesthesia machine, and other nonelectrical metal furniture which may come in contact with electric equipment shall be provided with approved jacks for the connection of grounding conductors to the patient ground when electrically susceptible patients are being treated.

NOTE: This requirement is not intended to apply to metal devices such as bedpans and other small portable nonelectric devices.

3366. Electric connection of the patient to the operating table shall be assured by the provision of a high resistance (conductive) strap in contact with the patient's skin, with one end of the strap fastened to the metal frame of an operating table meeting the requirements of 364.

337. Grounding Jacks and Plugs.

3371. Grounding jacks and plugs approved for the purpose shall be of the locking type with wiping contacts and a maximum contact resistance of 5 milliohms (see Figure 1 for configuration).

3372. An approved device is to be provided for determining

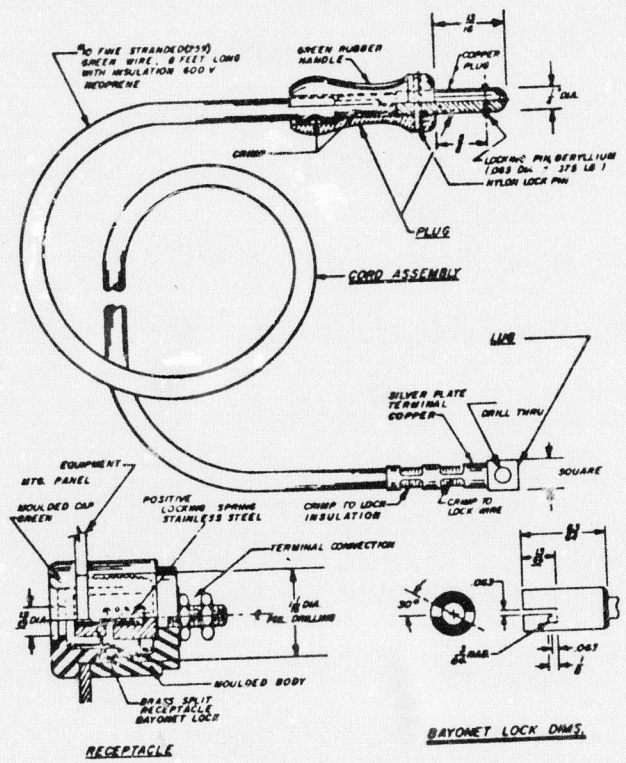


Fig. 1. Special hospital lock-type grounding plug.

the electric continuity between the patient ground and any grounded metal surface. If the test is performed when the system is in use on a patient, it must not endanger the patient even if the grounding circuit being tested is faulty. The resistance so measured is to be less than 0.1 ohm.

3373. Patient-connected electric devices shall be approved for the use and grounded by an identified grounding conductor in the line cord connected to the appropriate terminal in the attachment plug, or for fixed equipment, to the reference grounding point by an insulated grounding conductor run with the power conductors. Exception shall be made for approved double-insulated appliances with two-wire cords in nonflammable anesthetizing locations.

338. Branch Circuits and Wiring.

3381. A branch circuit supplying an anesthetizing location shall supply no other location.

Exception: Branch circuits supplying only fixed lighting fixtures in non-hazardous areas of anesthetizing locations, other than surgical lighting fixtures or supplying anly approved permanently installed X-ray equipment which complies with 3384, 3385, 4434 and 4436 may be supplied by a conventional grounded system, provided: (a) wiring for grounded and ungrounded circuits does not occupy the same raceways; (b) the lighting fixtures and the X-ray equipment (except the enclosed X-ray tube and the leads to the tube) are located at least eight feet above the floor or outside any anesthetizing location; and (c) switches for the grounded circuits are located outside of any anesthetizing location.

NOTE: Remote control stations for remote control switches may be installed in any anesthetizing location if the remote control circuit is energized from the ungrounded distribution system.

3382. Installed wiring shall be in metal raceway or shall be Type MI cable as required in NFPA No. 70–1971, Section 517-4. In addition, devices, appliances, fixtures or equipment, if of a type incorporating sliding contacts, arcing or sparking parts, including switches and overcurrent devices, shall be of the totally enclosed type or shall have all openings guarded or screened so as to prevent the dispersion of hot particles.

3383. Ceiling-suspended surgical lighting fixtures shall be supplied from an ungrounded electric distribution system (see 3311) which shall be monitored by a line isolation monitor as required by 3341. Switching or dimmer devices shall control secondary circuit conductors only.

NOTE 1: Chafing of the insulated wire in surgical lighting fixtures has resulted in hot metal dropping onto the surgical field. Contact of the live conductor with a poorly grounded fixture has created a shock hazard.

NOTE 2: It is desirable to operate the surgical ceiling light from a separate isolation transformer to avoid electric interference from some dimmer devices being fed back to patient monitoring equipment.

NOTE 3: Where interruption of illumination is acceptable, as with single filament lights, ceiling-suspended surgical lighting fixtures may be connected to a grounded source of supply, protected by approved individual ground fault circuit interrupters.

3384. All exposed metal of permanently installed X-ray equipment shall be grounded in accordance with the requirements of 335.

3385. Approved permanently installed X-ray equipment may be supplied through a conventional grounded distribution system if installed in accordance with 3381.

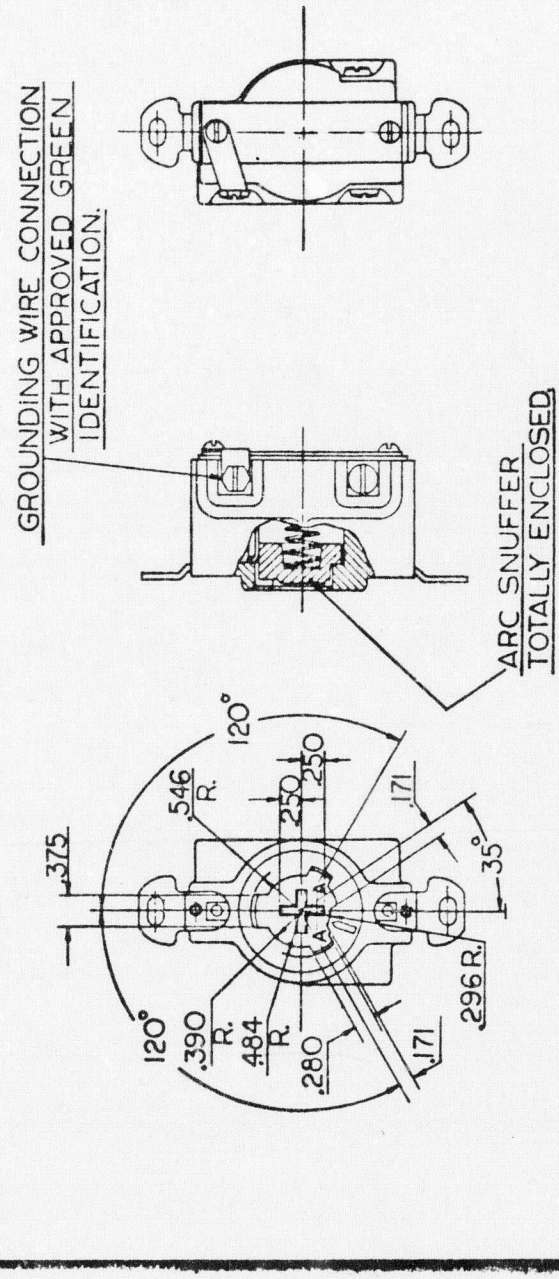


Fig. 2. Isolated power receptacle — two-pole, 20-ampere, 3-wire grounding.

3386. Specifications for wiring installed in flammable anesthetizing locations are contained in 3382 and 4411.

339. Service Equipment.

3391. Requirements for service equipment are listed in 4413 and 4414.

34. Electric Switches, Receptacles and Fixtures.

341. Electric Switches.

3411. Electric switches shall comply with 3382 and 3412. Specifications for switches used in hazardous locations shall comply with 4417 and 4418.

3412. Each ungrounded circuit within or partially within an anesthetizing location shall be controlled by a switch having a disconnecting pole for each conductor.

342. Receptacles and Attachment Plugs.

3421. Receptacles and attachment plugs for use in nonflammable anesthetizing locations and nonhazardous locations of flammable anesthetizing locations shall be of the isolated power type, or the mobile X-ray type described in Figures 2, 3 and 4.

3422. Plugs and receptacles for use with 250 volt, 50-ampere and 60-ampere ac service shall be designed for use in nonhazardous areas of flammable anesthetizing locations and nonflammable anesthetizing locations and shall be so designed that the 60-ampere receptacle will accept either the 50-ampere or the 60-ampere plug. Fifty-ampere receptacles are to be designed so as not to accept the 60-ampere attachment plug. These plugs shall be of the two-pole, three-wire design with a third contact connecting to the (green or green with yellow stripe) grounding wire of the electric system.

3423. The exposed portions of all plug and receptacle attachments intended for use in anesthetizing locations or with mobile medical X-ray equipment shall be smooth so that it is impossible to cut tender skin in handling or operating this equipment.

3424. All plug and cord combinations used in anesthetizing locations or with mobile medical X-ray equipment shall be watertight and of a design permitting easy cleaning.

3425. Receptacles provided for other services having different voltages, frequencies or types on the same premises shall be of such design that attachment plugs and caps used in such receptacles

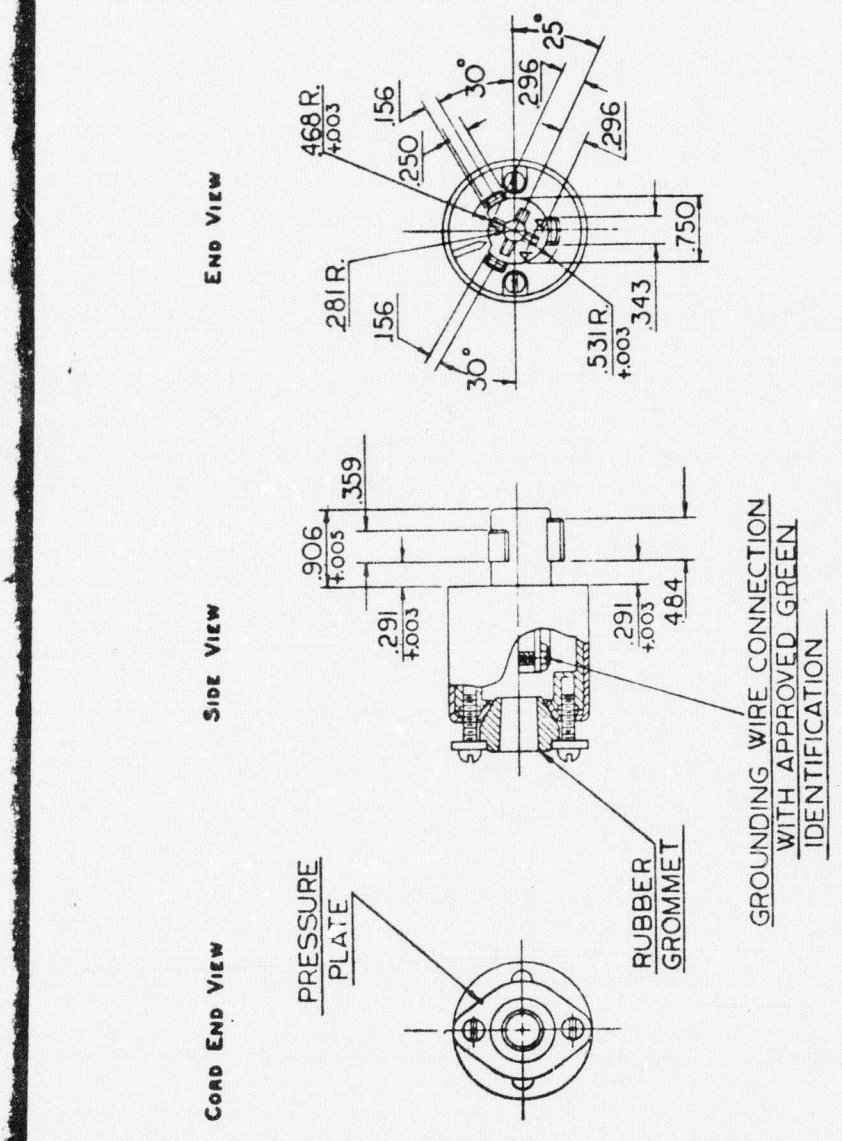


Fig. 3. Isolated power plug — two-pole, 20-ampere, 3-wire grounding type.

cannot be connected to circuits of a different voltage, frequency or type, but shall be interchangeable within each classification and rating required for two-wire, 125-volt, single phase alternating current service.

343. Ceiling-Suspended Fixtures.

3431. Ceiling-suspended fixtures for illumination of the operative field, if installed, shall comply with the following requirements:

(a) *Fixture:* The light source of the fixture shall be suitably protected against physical damage.

(b) *Supports:* Boxes, box assemblies or fittings used for these fixtures shall be approved for the purpose, and so supported that the supporting means does not become disengaged from its fastening during or as a result of movement of the fixture. The fixture shall be suspended by suitable rigid stems or other approved means. For stems longer than 12 inches, flexibility in the form of a fitting or flexible connector approved for the purpose shall be provided not more than 12 inches from the point of attachment to the supporting box or fitting.

3432. All exposed metal of permanently installed X-ray equipment shall be grounded in accordance with the requirements of 335.

3433. Approved permanently installed X-ray equipment may be supplied through a conventional grounded distribution system if installed in accordance with 3381.

3434. Specifications for X-ray equipment, installed in flammable anesthetizing locations are contained in 4434, and 4436.

35. Portable Electric Equipment.

351. Line Voltage Equipment.

3511. Any electric appliance or appendage that may be taken into the operating field by design or accident shall be constructed so that spillage of or immersion in body fluids, saline or dextrose, germicides, detergents, or other liquids will not result in a shock hazard (see 3784 and *Manual for the Safe Use of Electricity in Hospitals*, NFPA 76B-T–30216).

3512. Photographic lighting equipment for use in anesthetizing locations shall be of the totally enclosed type or so constructed as to prevent the escape of sparks or hot metal particles. The exposed metal parts of photographic lighting equipment shall be grounded as specified in 3513.

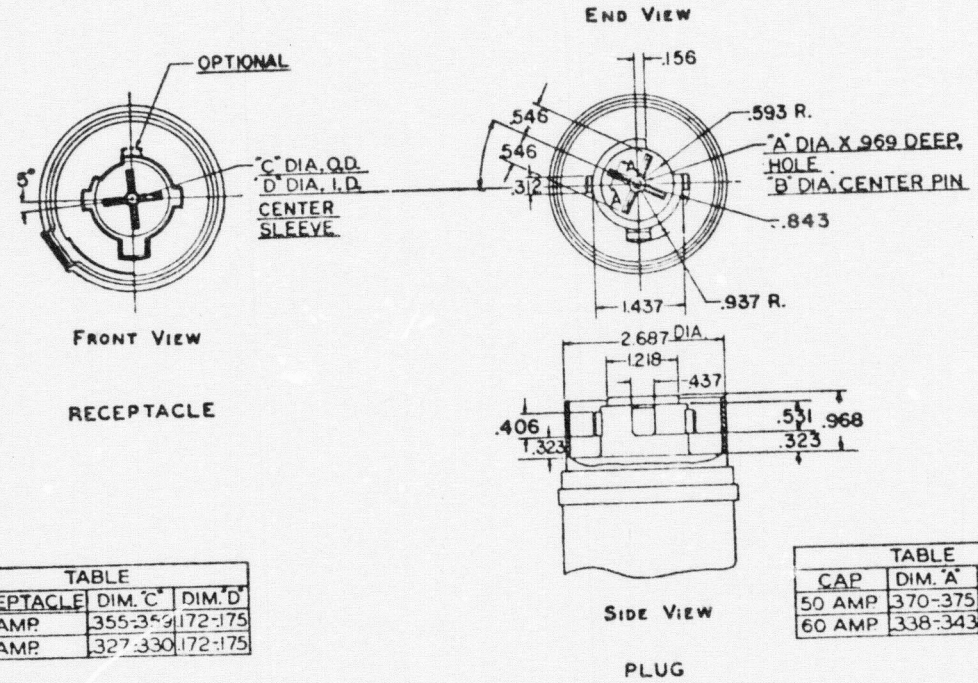


TABLE		
RECEPTACLE	DIM. "C"	DIM. "D"
50 AMP.	.355-.359	.172-.175
60 AMP.	.327-.330	.172-.175

TABLE		
CAP	DIM. "A"	DIM. "B"
50 AMP	.370-.375	.164-.168
60 AMP	.338-.343	.164-.168

Fig. 4. Hospital mobile X-ray receptacle and plug — 50- and 60-ampere, 2-pole, 3-wire, 250 volt ac.

3513. Exposed metal parts of electric equipment such as the frames or metal exteriors of motors, portable lamps and appliances, fixtures, cabinets and cases, intended for use in anesthetizing locations, shall be grounded as provided in Article 250, and in Section 501–16 of NFPA No. 70–1971 (see 335).

3514. Flexible cord for portable lamps or portable electric appliances operating at more than eight volts between conductors, intended for use in all anesthetizing locations (see 1501) shall be continuous and without switches from the appliance to the attachment plug and of a type designated for extra-hard usage in accordance with Section 501–11 of NFPA No. 70–1971. Such flexible cord shall contain one extra insulated conductor to form a grounding connection between the ground terminal of the polarized plug and metal lamp guards, motor frames, and all other exposed metal portions of portable lamps and appliances. Cords shall be protected at the entrance to equipment by a suitable insulating grommet. The flexible cord shall be of sufficient length to reach any position in which the portable device is to be used and the attachment plug shall be inserted only in a fixed, approved receptacle.

Exception: Foot treadle operated controllers are permitted in any anesthetizing location if appended to portable electric appliances in an approved manner of if integral with the supply cord and equipped with a connector containing a flammable anesthetizing location receptacle approved for use in Class I, Group C, Division 1 hazardous locations into which the equipment plug (see 4414, 4421 and 4423 may be inserted.

3515. Portable equipment shall be provided with a storage device for its flexible cord, so designed that the shortest radius to which the cord can be subjected is not less than three inches.

3516. Electric equipment which is defective or faultily grounded produces a definite shock hazard if connected to conventional grounded electric circuits and employed in the presence of purposely conductive flooring, as installed in corridors adjacent to operating rooms, or wet flooring as may be encountered in sterilizing or scrub rooms during use. All electric equipment employed in such areas shall be approved for the purpose (see 3775).

352. Low Voltage Equipment and Instruments.

3521. Low voltage equipment which is frequently in contact with the bodies of persons or has exposed current carrying elements shall:

(a) operate on an electrical potential of 8 volts or less, or

(b) be approved as intrinsically safe or double insulated

equipment,

(c) be moisture resistant (see 3511).

3522. Power shall be supplied to low voltage equipment from:

(a) an individual isolating transformer (auto-transformers shall not be used) connected to an outlet receptacle by means of an anesthetizing location cord and plug (see 3421–3425), or

(b) a common isolating transformer installed in a nonhazardous location, or

(c) from individual dry cell batteries, or

(d) from common batteries made up of storage cells located in a nonhazardous location.

3523. Isolating type transformers for supplying low voltage circuits shall:

(a) have approved means for insulating the secondary circuit from the primary circuit, and

(b) have the core and case grounded in an approved manner.

3524. Resistance or impedance devices may be used to control low voltage equipment, but shall not be used to limit the maximum input voltage.

3525. Battery-powered appliances shall not be capable of being charged while in operation unless their charging circuitry incorporates an integral isolating type transformer.

3526. Any receptacle or attachment plug used on low voltage circuits shall be of a type which does not permit interchangeable connection with circuits of higher voltage.

36. Cylinders, Regulators, Anesthetic Apparatus and Furniture.

361. Cylinders and Regulators.

3611. Approved regulators or other gas flow control devices shall be used to reduce the cylinder pressure of every cylinder used for medicinal purposes. All such devices shall have connections so designed that they can be attached only to cylinders of gas for which they are designated.

3612. Equipment which will permit the intermixing of different gases, either through defects in the mechanism or through error in manipulation in any portion of the high pressure side of any system in which these gases may flow, shall not be used for

coupling cylinders containing compressed gases. It is particularly important that the intermixing of oxidizing and flammable gases under pressure be scrupulously avoided, as such mixing may result in violent explosion.

3613. Cylinder valve outlet connections for oxygen shall be Connection No. 540 as described in American National Standard B57.1–1965, *Compressed Gas Cylinder Valve Outlet and Inlet Connections.*

3614. Cylinder valve outlet connections for nitrous oxide shall be Connection No. 9320 as described in American National Standard B57.1–1965, *Compressed Gas Cylinder Valve Outlet and Inlet Connections.*

3615. Yoke-type connections between anesthesia apparatus and flush-type cylinder valves (commonly used with anesthetic gas cylinders) shall be Connection No. 860 as described in American National Standard B57.1–1965, *Compressed Gas Cylinder Valve Outlet and Inlet Connections* (see Appendix A 3621).

362. Anesthetic Apparatus.

3621. Anesthetic apparatus shall be subject to approval by the authority having jurisdiction.

3622. Each yoke on anesthetic apparatus constructed to permit attachment of small cylinders equipped with flush-type valves shall have two pins installed as specified in ANSI Standard B57.1–1965 (pin-index safety system) (see 3227 and Appendix A 3225).

3623. After any adjustment or repair involving use of tools, and before use on patients, the gas anesthesia apparatus shall be tested at the final common path to the patient to determine that oxygen and only oxygen is delivered from the oxygen flow meters, and oxygen flush valve if any. Interventions requiring such testing shall include, but not be limited to:

alteration of pipeline hoses or fittings;

alteration of internal piping;

adjustment of selector switches or flush valves;

replacement or repair of flow meters or bobbins.

A paramagnetic or polarographic oxygen analyser, or a similar device, known to be accurate at 0%, 21% and 100% oxygen is a suitable test instrument (see Appendix F3).

***364. Furniture.**

3641. All items of furniture constructed of metal shall meet the requirements of 3365 if this paragraph is applicable.

3642. Specifications for items of furniture intended for use in flammable anesthetizing locations are set forth in 469.

37. Administration and Maintenance.

371. Purpose.

3711. This section contains the requirements for administration and maintenance which shall be followed as an adjunct to physical precautions specified in 31–35.

372. Recognition of Hazards and Responsibility.

3721. The hazards involved in the use of anesthetic agents can be successfully mitigated only when all of the areas of hazard are fully recognized by all personnel, and when the physical protection provided is complete and is augmented by attention to detail by all personnel of administration and maintenance having any responsibility for the functioning of anesthetizing locations. Since 37 is expected to be used as a text by those responsible for the mitigation of associated hazards, the requirements set forth herein are frequently accompanied by explanatory text.

3722. Responsibility for the maintenance of safe conditions and practices in anesthetizing locations falls mutually upon the governing body of the hospital, all physicians using the anesthetizing locations, the administration of the hospital, and those responsible for hospital licensing, accrediting, or other approved programs.

3723. Inasmuch as the ultimate responsibility for the care and safety of patients in a hospital is that of the governing board of the hospital, that body in its responsibility for enforcement of requirements contained in this standard shall determine that adequate regulations with respect to anesthesia practices and conduct in anesthetizing locations have been adopted by the medical staff of the hospital and that adequate regulations for inspection and maintenance are in use by the administrative, nursing and ancillary personnel of the hospital.

3724. By virtue of its responsibility for the professional conduct of members of the medical staff of the hospital, the organized medical staff shall adopt adequate regulations with respect to the use of inhalation anesthetic agents and to the prevention of electric shock and burns (see Appendix B) and through its formal organization shall ascertain that these regulations are regularly adhered to.

3725. In meeting its responsibilities for safe practices in anesthetizing locations, the hospital administration shall adopt or correlate regulations and standard operating procedures to assure that

both the physical qualities and the operating maintenance methods pertaining to anesthetizing locations meet the standards set in this standard. The controls adopted shall cover the conduct of professional personnel in anesthetizing locations, periodic inspection to ensure the proper grounding of dead metal (see 335 and 3871), and inspection of all electrical equipment (see NFPA 76B-T), including testing of line isolation monitors.

3726. The surgeon or anesthesiologist after consultation shall identify and designate Risk III patients and be responsible for protective grounding being used and appropriate tests being performed to demonstrate continuity of grounding circuits.

3727. Hospital licensing and other approval bodies, in meeting their responsibilities to the public, should include in their inspections not only compliance with requirements for physical installations in anesthetizing locations, but also compliance with the requirements set forth in 37.

373. Rules and Regulations.

3731. Hospital authorities and professional staffs shall jointly consider and agree upon necessary rules and regulations for the control of personnel concerned with anesthetizing locations. Upon adoption, rules and regulations shall be prominently posted in the operating room suite. Positive measures are necessary to acquaint all personnel with the rules and regulations established and to assure enforcement.

3732. This standard recognizes that most hospitals contain operating and delivery rooms designed for the use of flammable agents. It also recognizes that there may be some operating rooms and even entire operating suites designed for the exclusive use of nonflammable agents. A particular hazard exists where personnel elect to employ a flammable agent in a room not designed for it, or where a flammable agent is employed in a nonflammable anesthetizing location without taking the proper administrative steps.

3733. Appendix B contains three sets of proposed regulations applying to the specific types of anesthetizing locations as defined in 1517, 1532 and 1535.

Set (1) contains regulations for flammable anesthetizing locations, which shall be adopted by hospitals for all anesthetizing locations designed for the safe administration of flammable inhalation anesthetic agents.

Set (2) contains regulations for nonflammable anesthetizing locations, which shall be adopted by hospitals for all anesthetizing locations designed for the exclusive administration of nonflammable agents.

Set (3) contains regulations for mixed facilities which shall be adopted by hospitals in which flammable anesthetizing locations and nonflammable anesthetizing locations co-exist within the same building, allowing interchange of personnel and equipment between flammable and nonflammable anesthetizing locations.

3734. Anesthetizing locations shall be identified as noted in 6131.

3735. It is recommended that the hazard symbols contained in *Identification of Materials*, NFPA No. 704M be employed throughout the hospital, as appropriate. Such use is particularly important in the operating suite and in gas and volatile liquid storage facilities.

3736. All pieces of equipment used in anesthetizing locations shall be labeled to indicate that they comply with applicable safety regulations.

***3737.** Transportation of patients while an inhalation anesthetic is being administered by means of a mobile anesthesia machine shall be prohibited, unless deemed essential for the benefit of the patient in the combined judgement of the surgeon and anesthetist (see A3737).

3738. (a) Medicaments, including those dispersed as aerosols, may be used in anesthetizing locations for germicidal purposes, for affixing plastic surgical drape materials, for preparation of wound dressing, or for other purposes.

(b) Liquid germicides used in anesthetizing locations, whenever the use of cautery or electrosurgery is contemplated, shall be nonflammable.

(c) Whenever flammable aerosols are employed, sufficient time shall be allowed to elapse between deposition and application of drapes to permit complete evaporation of any flammable vehicle remaining.

NOTE: Inhibited 1,1,1-trichloroethane is a suitable defatting agent. Ether and tinctures of disinfecting agents are flammable and often are improperly used during surgical procedures. Tipping containers, accidental spillage and the pouring of excessive amounts of such flammable agents on patients expose them to injury in the event of accidental ignition of the flammable solvent.

3739. Smoking, open flames and hot objects shall be prohibited in all anesthetizing locations.

374. Ventilation and Humidification.

3741. Ventilating and humidifying equipment for anesthetizing locations shall be kept in operable condition, and continually operating during surgical procedures (see Appendix A 3111).

3742. Rooms or enclosures used for storage of oxygen or nitrous oxide (see 312) shall be vented to the outside if the cylinder of manifold capacity exceeds ,500 cubic feet. Routine inspection shall assure that such ventilation is not obstructed.

***375. Handling of Gases.**

3751. Hospital administrative authorities shall provide regulations to assure that standards for safe practice in the Specifications for Cylinders,* Marking of Cylinders, Regulators and Valves and Cylinder Connections have been met by vendors of cylinders containing compressed gases supplied to the hospital (see Appendix A 375).

3752. Cylinder contents shall be identified by attached labels or stencils naming the components and giving their proportions. Labels and stencils shall be lettered in accordance with ANSI Standard No. Z48.1–1954.

3753. Before piping systems are initially put into use, the hospital authority shall be responsible for ascertaining that the gas delivered at the outlet is that shown on the outlet label and that the proper connecting fittings are checked against their labels.

3754. Hospital authorities, in consultation with medical staff and other trained personnel, shall provide and enforce regulations for the storage and handling of containers of oxygen, and nitrous oxide in storage rooms of approved construction (see 1501), and for the safe handling of these agents in anesthetizing locations. Storage locations for anesthetizing agents, established in any operating or delivery suite, shall be limited by space allocation and regulation to not more than a 48-hour normal requirement for any such suite. In storage locations, cylinders shall be properly secured in racks or adequately fastened. No cylinders containing oxygen or nitrous oxide, other than those connected to anesthetic apparatus, shall be kept or stored in anesthetizing locations.

NOTE: Electric wiring and equipment in storage rooms for oxygen and nitrous oxide are not required to be explosion-proof.

3755. Cylinders containing compressed gases and cans containing volatile liquids shall be kept away from radiators, steam

*See Appendix C for availability.

pipes, and like sources of heat. Oxygen and nitrous oxide cylinders may be stored in the same room.

3756. Combustible materials, such as paper, cardboard, wood and fabrics, shall not be stored or kept near cylinders containing oxygen or nitrous oxide. An exception to the rule may be made in the case of cylinder shipping crates or cartons. Wrappers shall be removed prior to storage.

376. Special Precautions — Oxygen Cylinders and Manifolds

3761. Great care shall be exercised in handling oxygen to prevent contact of oxygen under pressure with oils, greases, organic lubricants, rubber, or other materials of an organic nature. The following regulations, based on those of the *Compressed Gas Association*, Pamphlet G-4, shall be observed:

(a) Oil, grease, or readily flammable materials shall never be permitted to come in contact with oxygen cylinders, valves, regulators, gages, or fittings.

(b) Regulators, fittings, or gages shall never be lubricated with oil or any other flammable substance.

(c) Oxygen cylinders or apparatus shall never be handled with oily or greasy hands, gloves or rags.

(d) Particles of dust and dirt shall be cleared from cylinder valve openings by slightly opening and closing the valve before applying any fitting to the cylinder.

(e) The high pressure valve on the oxygen cylinder shall be opened before bringing the apparatus to the patient.

(f) The cylinder valve shall be opened slowly, with the face of the gage on the regulator pointed away from any person.

(g) An oxygen cylinder shall never be draped with any materials such as hospital gowns, masks or caps.

(h) Oxygen fittings, valves, regulators or gages shall never be used for any service other than that of oxygen.

(i) Gases of any type shall never be mixed in an oxygen or any other cylinder.

(j) Oxygen shall always be dispensed from a cylinder through a pressure regulator.

(k) Regulators which are in need of repair, or cylinders having valves which do not operate properly, shall never be used.

Oxygen equipment which is defective shall not be used until it has been repaired by competent personnel. If competent

in-house repairs cannot be made, such equipment shall be repaired by the manufacturer or his authorized agent; or it shall be replaced.

(m) Oxygen cylinders shall be protected from abnormal mechanical shock which is liable to damage the cylinder, valve, or safety device. Such cylinders shall not be stored near elevators, gangways or in locations where heavy moving objects may strike them or fall on them.

(n) Cylinder valve protection cans, when provided, shall be kept in place and be hand tightened, except when cylinders are in use or connected for use.

(o) Cylinders shall be protected from the tampering of unauthorized individuals.

(p) Storage shall be planned so that cylinders may be used in the order in which they are received from the supplier.

(q) Empty and full cylinders shall be stored separately. Empty cylinders shall be marked, to avoid confusion and delay if a full cylinder is needed hurriedly.

(r) Cylinders stored in the open shall be protected against extremes of weather and from the ground beneath to prevent rusting. During winter, cylinders stored in the open shall be protected against accumulations of ice or snow. In summer, cylinders stored in the open shall be screened against continuous exposure to direct rays of the sun in those localities where extreme temperatures prevail.

(s) Valves shall be closed on all empty cylinders in storage.

(t) Oxygen shall be referred to by its proper name "OXYGEN," not "AIR." Liquid oxygen shall be referred to by its proper name, not "Liquid Air."

(u) Oxygen shall never be used as a substitute for compressed air.

(v) Cylinders or cylinder valves shall not be repaired, painted or altered.

(w) Safety relief devices in valves or cylinders shall never be tampered with. Sparks and flame shall be kept away from cylinders; a torch flame shall never be permitted under any circumstances to come in contact with cylinder valves or safety devices. Valve outlets clogged with ice shall be thawed with warm — not boiling — water.

(x) The markings stamped on cylinders shall not be tampered with. It is against federal statutes to change these markings without written authority from the Bureau of Explosives.

(y) Markings which are used for identification of contents of cylinder shall not be defaced or removed, including decals, tags, stencilled marks and upper half of shipping tag.

(z) The owner of the cylinder shall be notified if any condition has occurred which might permit any foreign substance to enter cylinder or valve, giving details and cylinder number.

(aa) Even if they are considered to be empty, cylinders shall never be used as rollers, supports, or for any purpose other than that for which they are intended by the supplier.

3762. TRANSFER OF GAS FROM ONE CYLINDER TO ANOTHER ON THE HOSPITAL SITE OR BY HOSPITAL PERSONNEL SHALL BE PROHIBITED.

377. Electrical Safeguards.

3771. Physical safeguards built into the anesthetizing locations or storage areas will not provide protection unless safe practices are followed and good maintenance is provided.

3772. Scheduled inspections and written reports shall be maintained.

3773. Rules to require prompt replacement of defective electrical equipment shall be adopted and rigidly enforced.

3774. Maintenance employees shall be properly acquainted with the importance of the work they are expected to do in storage locations for flammable anesthetic agents and anesthetizing locations, in order that their informed cooperation may be assured.

3775. Electric equipment which is defective or faultily grounded produces a definite shock hazard if connected to conventional grounded electric circuits and employed in the presence of purposely conductive flooring, as installed in corridors adjacent to operating rooms, or wet flooring as may be encountered in sterilizing or scrub rooms during use. All electric equipment employed in such areas shall be approved for the purpose and shall be examined periodically for electric integrity.

3776. Members of the professional staff shall be required to submit for inspection and approval any special equipment they wish to introduce into anesthetizing locations. Such equipment shall meet the requirements for the protection against electric shock as given in this standard (see 335 and 351).

3777. Equipment which introduces current to the patient's body shall have the output current isolated from ground to insure

against an unintentional return circuit through the patient.

378. Electric Connections and Testing.

3781. Administrative authorities shall ascertain that electric maintenance personnel are completely familiar with the function and proper operation of ungrounded electric circuits required by 331. The significance of the signal lamps and audible alarms installed to indicate accidental grounds shall be explained to all personnel affected. A permanent sign shall be installed close to the position of the signal lamps to indicate their significance. Circuits in the panel boxes shall be clearly labeled, distinguishing between grounded and ungrounded, emergency and normal circuits, so that immediate recognition is possible.

3782. Extension cords shall not be connected to lighting fixtures in anesthetizing locations under any circumstance.

***3783.** The operating table and the anesthesia machine prior to the application of electric appliances to an electrically susceptible patient shall be connected to the patient ground by means of an insulated stranded #10 copper grounding conductor 10 feet long fitted with approved plugs (see 3371).

NOTE: The operating table is capacitance coupled to the patient. By connecting it to the patient ground, a significant reduction in electrical noise on monitoring equipment should result.

3784. HAZARDS DUE TO SUBMERSION IN BODY FLUIDS. Any portable device designed for use in the operating room or anesthetizing locations, on or in the vicinity of the patient and subject to exposure to body fluids, saline, dextrose and the like shall be capable of withstanding immersion in a 3 percent sodium chloride solution for one hour without producing a current of more than 5 milliamperes (measured from a metal plate of 4 sq. in. in the salt solution, through a 1000 ohm resistance, to ground).

This requirement applies to small devices and to mobile appendages of larger fixed devices. It is specifically intended to apply to cast cutters, cast dryers, bone saws, bone reamers, dermatome, I.V. pumps, hair clippers, razors, and similar devices.

3785. TESTING THE LINE ISOLATION MONITOR. The proper functioning of the line isolation monitor circuit shall be tested at intervals of not more than one week, and only when the circuit is not otherwise in use, by successively grounding each line of the energized distribution system through a resistor of $1000 \times V$ ohms, where V = line voltage. A permanent record shall be kept of the results of such tests.

NOTE: These periodic tests are intended to determine proper operation of the line isolation monitor but not compliance with the requirements of 3346. The 1000 × V ohm resistor limits the current in case of faults.

3786. TESTING GROUND CONTINUITY. The continuity between the patient ground point, the operating table, and the anesthesia machine shall be tested prior to the application of electric equipment to the patient (see 3372).

Part IV

Requirements for Flammable Anesthetizing Locations and Flammable Agent Storage Locations

41. Ventilation, Humidification and Cooling.

411. Anesthetizing Locations.

4111. Requirements for ventilation, humidification and cooling of flammable anesthetizing locations are set forth in 3111, 3112, 3113 and 3114.

4112. If a window-type temperature regulating unit (air-conditioner) is installed so that any part is less than five feet from the floor of a flammable anesthetizing location, such units shall comply with the requirements set forth in 4113.

4113. Such window-type temperature-regulating units shall be provided with a vertical divider which effectively prevents air flow from the room side to the outside side, and all electric equipment on the room side of this divider shall meet the requirements of 4411. The installed unit shall tightly fit the opening in the window or wall. Openings in the divider for shafts of fans, other moving parts or wiring, shall be gasketed unless the local air pressure on the room side of the opening when the unit is in operation is less than that on the outdoor side. A fresh air port may be provided in the divider if it is automatically closed when the unit is not in operation. The rotating parts of fans on the room side of the divider shall not cause percussion sparks if they accidentally contact surrounding objects.

412. Storage Locations for Flammable Anesthetizing Agents.

4121. Enclosures in which flammable agents are stored (see 1541) shall be individually and continuously ventilated by gravity or by mechanical means at a rate of not less than 8 air changes per hour. The fresh air inlet and the exhaust air outlet within the enclosure shall be located as far apart as feasible consistent with the enclosure layout. The fresh air inlet shall be located at or near the ceiling, and the bottom of the exhaust air outlet shall be located 3 inches above the floor. The fresh air supply may be heated. Exhaust air shall be discharged to the exterior of the building at least 12 feet above grade in a manner to prevent its re-entry to the building.

4122. Exhaust fans shall have nonsparking blades. The fan

motor shall be connected into the equipment system (either automatic or delayed restoration) (see *Essential Electrical Systems for Hospitals*, NFPA No. 76A). All electric installations shall conform to NFPA No. 70, and, when inside the storage area or exhaust duct, shall be approved for use in Class I, Group C, Division 2 locations. A visual signal which indicates failure of the exhaust system shall be installed at the entrance to the storage area.

NOTE: Exhaust fans in all new installations, and whenever possible in existing installations, should be located at the discharge end of the exhaust duct.

4123. Approved fire dampers shall be installed in openings through the required fire partition in accordance with the requirements of *Air Conditioning and Ventilating Systems* (Non-Residential), NFPA No. 90A.

4124. The electric installation in storage locations for flammable anesthetic agents shall comply with the requirements of 441.

4125. This standard prohibits the piping of flammable anesthetic gases (see also NFPA 56F).

4126. Conductive flooring (see 462) is required in cylinder storage locations for flammable anesthetic agents when such storage locations are a part of the operative or obstetrical suite.

42. Areas Adjoining Hazardous Locations.

4211. An adjoining area connected by a closable doorway, such as a corridor, sterilizing room, scrub-room, X-ray control room, or monitoring room, where it is not intended to store or administer flammable anesthetics, is not considered a hazardous location.

4212. Areas described in 4211 may be ventilated in accordance with the applicable sections of NFPA No. 70 for ordinary locations.

4213. Conductive flooring is required in these adjoining areas to remove static charges from personnel or objects before they enter the hazardous location (see Appendix A462).

4214. Post anesthesia recovery rooms are not considered to be hazardous locations unless specifically intended for the induction of inhalation anesthesia with flammable anesthetic agents (see 4722).

43. Electric Distribution.

431. Isolated Power System.

4311. The isolated electric system, specified in 33 for anesthe-

tizing locations, shall be explosion-proof for hazardous locations (see 150-Definitions).

44. Wiring, Receptacles, and Fixtures.

441. Electric Wiring and Equipment.

4411. Electric wiring and fixed equipment installed less than five feet above the floor in flammable anesthetizing locations (see 150-Definitions) shall comply with the requirements of NFPA No. 70–1971, Article 501, Class I, Division 1. Equipment installed therein shall be approved for use in Class I, Group C, Division 1 hazardous locations.

4412. Wiring for fixed equipment installed more than five feet above the floor shall comply with 3383.

4413. All service equipment, switchboards, or panelboards shall be installed in a nonhazardous location.

4414. CONTROL DEVICES: Devices or apparatus such as motor controllers, thermal cutouts, switches, relays, the switches and contactors of auto-transformer starters, resistance and impedance devices, which tend to create arcs, sparks, or high temperatures, shall not be installed in hazardous locations unless devices or apparatus are of a type approved for use in Class I, Group C atmospheres in accordance with Sections 501–6(a) (see 150-definition of Hazardous Location in Flammable Anesthetizing Location) or Sections 501–6(b) and 501–7(b) (see 150-definition of Storage Location for Flammable Anesthetics) of NFPA No. 70–1971.

NOTE: It is recommended that control devices for such purposes be installed in a nonhazardous location and actuated by some suitable mechanical, hydraulic, or other nonelectric remote control device which may be operated from any desired location. This recommendation applies particularly to foot and other switches which must be operated from a location at or near the floor.

4415. Electric wiring and equipment in storage locations for flammable anesthetic agents shall comply with the requirements of NFPA No. 70–1971, Article 500, Class I, Division 2 and equipment used therein shall be approved for use in Class I, Group C, Division 1 hazardous locations (see 335 for grounding requirements).

4416. The provisions of 331 for ungrounded electric distribution systems do not apply to storage locations for flammable agents.

4417. Electric switches installed in hazardous locations of flammable anesthetizing locations (see 15[illegible]) shall comply with the requirements of Section 501–6(a) of NFPA No. 70.

4419. Electric switches installed in other than hazardous locations shall comply with 3383.

442. Receptacles and Attachment Plugs.

4421. Receptacles and attachment plugs in hazardous locations (see 1517, 1524, 1532) shall comply with the requirements of Section 501-12 of NFPA No. 70. They shall be a part of an approved unit device with an interlocking switch arranged so that the plug cannot be withdrawn or inserted when the switch is in "on" position.

NOTE: It should be recognized that any interruption of the circuit, even of circuits as low as eight volts, either by any switch or loose or defective connections anywhere in the circuit, may produce a spark sufficient to ignite a flammable anesthetic agent.

4422. Attachment plugs for use in hazardous locations of flammable anesthetizing locations for 125 volt, 20-ampere, ac service shall be designed for interchangeability, for direct connection without the use of adaptors with Class I, Group C, Division 1 receptacles in hazardous locations, and with isolated power receptacles in nonhazardous locations. Nonexplosion-proof plugs shall not engage, and be energized by, the poles of Class I, Group C, Division 1 receptacles.

443. Ceiling-suspended Fixtures.

4431. The light source of ceiling-suspended surgical lighting fixtures installed above hazardous locations shall not enter the hazardous area, and if in an enclosure, the enclosure shall not enter the hazardous location in its lowest position, unless it is approved for hazardous locations.

4432. If installed above a hazardous location, fixtures with sliding contacts, or arcing or sparking parts shall be installed so that in any position of use, no sliding contacts or arcing or sparking parts shall extend within the hazardous location.

4433. Integral or appended switches, if installed on ceiling-suspended surgical lighting fixtures, shall be approved for use in Class I, Group C, Division 1 hazardous locations if a switch is installed in, or can be lowered into, the hazardous location.

4434. Lamps installed in fixed position in hazardous locations shall be enclosed in a manner approved for use in Class I, Group C, Division 1 hazardous locations and shall be properly protected by substantial metal guards or other means where exposed to breakage. Lamps shall not be of the pendent type unless supported by and supplied through hangers of rigid conduit or flexible connectors approved for use in Class I, Group C, Division 1 hazardous locations in accordance with Section 501-9(a) (see 1523) or Section 501-9(b) (see 1541, of NFPA No. 70-1971).

4435. Tube heads and cable of permanently installed X-ray equipment in flammable anesthetizing locations shall be approved for use in Class I, Group C atmospheres.

4436. VIEWING BOX LIGHTING: Film viewing boxes in hazardous locations shall either comply with the requirements of Section 501–9(a) of NFPA No. 70–1971, or they shall be of a type which excludes the atmosphere of the room. If located above the five-foot level in a flammable anesthetizing location or mixed facility, or in a nonflammable anesthetizing location, the film viewing box may be of the totally enclosed type or so constructed as to prevent the escape of sparks or hot metal. Such viewing boxes may be connected to a conventional grounded supply circuit, if the device is protected by an approved system of double insulation. Where such an approved system is employed, the equipment shall be distinctly marked.

4437. Control units and other electric apparatus installed or intended for use in a flammable anesthetizing location shall comply with the requirements of 4411 (see also 4575 and 6145).

4438. All equipment of signaling and communication systems in hazardous locations (see 1523 and 1543), irrespective of voltage shall be of a type approved for use in Class I, Group C, Division 1 hazardous locations in accordance with Section 501–14(a) (see 1523) or Section 501–14(b) (see 1541) of NFPA No. 70–1971.

45. Portable Electric Equipment.

451. Line Voltage Equipment.

4511. All equipment intended for use in anesthetizing locations shall be labeled by the manufacturer to indicate whether it may be used in a flammable anesthetizing location. Electric equipment presently in use shall be so labeled by the user. Labeling shall be permanent, conspicuous and legible when the equipment is in the normal operating position.

4512. Suction, pressure, or insufflation equipment, involving electric elements and located within the hazardous location shall be of a type approved for use in Class I, Group C, Division 1 hazardous locations. Means shall be provided for liberating the exhaust gases from such apparatus in such a manner that gases will be effectively dispersed without making contact with any possible source of ignition.

NOTE: Suction or pressure apparatus serving flammable anesthetizing locations but located outside such flammable anesthetizing locations need not be approved for Class I, Group C, Division 1 hazardous locations, providing the discharge from suction machines is kept away from sources of ignition.

4513. Portable X-ray equipment intended for use in flammable anesthetizing locations and in mixed facilities shall be approved for use in hazardous locations, Class I, Group C, Division 1 hazardous locations and may be provided with an approved positive pressure system for the tube head and cables within the hazardous area (see 4516(b)). All devices and switches for X-ray equipment within the hazardous location (see 150) shall conform to requirements of 4434, 4436 and 4414. X-ray equipment shall be provided with an approved method of eliminating electrostatic accumulation (see 3385, 3386, 4434 and 4436).

4514. High frequency equipment intended for use in flammable anesthetizing locations shall be approved for use in Class I, Group C, Division 1 hazardous locations. Remote control switches are recommended (see 4414 and 4723). For recommendations in connection with the use of cautery and high frequency equipment in flammable anesthetizing locations, see 452 and Appendix B, Regulation Set (1), 4(d) and Set (3), 4(3), and NFPA No. 76CM.

4515. Portable electric equipment, such as incubators, lamps, heaters, motors and generators, used in flammable anesthetizing locations in which anesthesia equipment is present or in operating condition, shall comply with requirements of Articles 500, 501 and 517 of NFPA No. 70–1971 for Class I, Division 1 locations and shall be approved for Class I, Group C, Division 1 hazardous locations except as permitted in 4516.

NOTE: The resistance and capacitive reactance between the conductors and the noncurrent-carrying metallic parts must be high enough to permit the use of the equipment on an ungrounded distribution system having a line isolation monitor specified in 3341.

4516. The following shall be considered exceptions to 4511 and 4415.

(a) Equipment designed to operate on circuits of eight volts or less shall comply with 352.

(b) Portable electric or electronic equipment mounted within an enclosure and protected by an approved positive- pressure ventilating system which conforms with the following requirements shall otherwise comply with the standards of NFPA No. 70 for ordinary locations. The enclosure of such a system shall be supplied with air taken from a nonhazardous location and circulated to maintain within the enclosure a pressure of at least one inch of water above that of the hazardous area; and shall be provided with means to de-energize the equipment if the air temperature exceeds 60° C (150° F.), or if the pressure differential drops below one inch of water. The positive pressure shall be continuously maintained

whether or not the equipment is in use, or means shall be provided to insure that there are at least ten changes of air within the enclosure before any electric equipment within the enclosure that does not comply with the requirements of 4415 is energized. The enclosure with its equipment shall be approved for use in Class I, Group C, Division 1 hazardous locations.

(c) Portable electric or electronic equipment if it is mounted on a floor-borne movable assembly which will not overturn (1) when it is tilted through an angle of 20 degrees or (2) when in a normal operating position a horizontal force of 25 pounds is applied at a height of five feet above the floor; and if the equipment, together with its enclosure, cannot be lowered within five feet of the floor without tilting the assembly, need not be approved for use in Class I, Group C, Division 1 hazardous locations, but shall comply with the requirements of 4515. The entire assembly shall be approved for use in anesthetizing locations as defined in 150.

(d) Intrinsically safe electric or electronic equipment which is incapable of releasing sufficient electric energy under normal or abnormal conditions to cause ignition of flammable anesthetic mixtures may be approved for use in Class I, Group C, Division 1 hazardous locations as provided in Section [illegible]–1 of NFPA No. 70–1971.

4517. Photographic lighting equipment used in flammable anesthetizing locations shall comply with provisions of 451 to prevent ignition of flammable gases (see 3512). Lamps used above the hazardous location shall be suitably enclosed to prevent sparks and hot particles falling into the hazardous location. Photoflash and photoflood lamps which are not suitably enclosed shall not be used within an anesthetizing location. Neither flash tubes nor their auxiliary equipment shall be used within the hazardous location. Flash-tube operation may be accompanied by sparking at switches, relays and socket contacts, and by corona discharge of flashovers from high voltage circuits.

4518. The exposed metal parts of photographic lighting equipment shall be grounded as specified in 3513.

4519. Administrative vigilance is required to prohibit the use of portable electric equipment and appliances, such as electric drills, of a type unsuitable for use in hazardous locations in flammable anesthetizing locations during their occupancy by patients or near anesthesia equipment in operating condition and in storage locations containing flammable anesthetic agents.

452. Cautery and Electrosurgical Equipment.

4521. This standard has been devised to allow the surgeon and anesthesiologist wide choice of anesthetic agents, and refrains from prohibiting categorically the use of cautery and electrosurgical equipment, high frequency equipment, and low voltage instruments. Hospital administrative authorities shall take such steps as are necessary to impress upon personnel the additional risk involved in the use of cautery, electrosurgical equipment and low voltage devices during operations in which flammable anesthetics are used.

4522. Electrosurgical equipment shall not be used for operations on the head, neck, oropharynx or body cavities during or following the administration of a flammable anesthetizing agent.

NOTE: Arcs from the high-frequency electrode manipulated by the surgeon have become a major cause of explosions during anesthesia. Excretion of a flammable agent after its administration has been discontinued, or liberation of a flammable agent dissolved in the nonflammable anesthetic exposed in an anesthetic circuit charged with a flammable agent, is a source of a combustible mixture. In either event, the period of dissipation of the hazard is too long to be practical during the operation.

4523. The patient shall be so draped when cautery or electrosurgical equipment is used that a barrier will be provided against any escape of flammable mixtures to the area in which the cautery or electrosurgical equipment is being applied.

NOTE: Switches and control devices for cautery, electrosurgical equipment or other portable electric equipment or instruments should be operated at a distance of at least two feet from any portion of any anesthesia system containing mixtures of flammable gases (see also 3512, 4414 and 4514).

453. Low Voltage Equipment.

4531. Specifications for portable equipment operating on low voltage power supplies and not stated in 4516(a) and 452 are stated in 352.

46. Reduction in Electrostatic Hazard.

461. Purpose.

4611. The requirements of this section have been promulgated to reduce the possibility of electrostatic spark discharges, with consequent ignition of flammable gases (see 231).

4612. The prevention of the accumulation of static charges revolves about a number of safeguards which shall be complied with in flammable anesthetizing locations, in corridors and passage-

ways adjacent thereto, in rooms connecting directly to anesthetizing locations, such as scrub rooms and sterilizing rooms, and in storage locations for flammable anesthetic agents located in an operating suite.

4613. The methods employed to prevent such accumulation include the installation of conductive flooring (see 462), the maintenance of the relative humidity at 50 percent at least, and the use of certain items of conductive equipment, accessories and wearing apparel.

***462. Conductive Flooring.**

4621. Conductive flooring shall be installed in those areas specified in 4612. Conductive flooring installed in corridors or passage ways in compliance with 4612 shall extend the width of the corridor and along the corridor a minimum of 10 feet on each side of door frames.

4622. A conductive floor shall meet the resistance provisions through its inherent conductive properties. The surface of the floor in the locations specified by 4612 and 4621 shall provide a path of moderate electric conductivity between all persons and equipment making contact with the floor to prevent the accumulation of dangerous electrostatic charges. No point on a nonconductive element in the surface of the floor shall be more than ¼ inch from a conductive element of the surface, except as permitted in 4625.

4623. The resistance of the conductive floor shall be less than 1,000,000 ohms as measured between two electrodes placed three feet apart at any points on the floor.

4624. The resistance of the floor shall be more than 25,000 ohms, as measured between a ground connection and an electrode placed at any point on the floor, and also as measured between two electrodes placed three feet apart at any points on the floor.

NOTE: This minimum is specified as an additional protection against electric shock.

4625. Floor drains, if installed in anesthetizing locations, shall be of the insulating type.

4626. The conductive floor shall be grounded to the room ground (see 3356).

4627. The resistance of conductive floors shall be initially tested prior to use. Thereafter, measurements shall be taken at intervals of not more than one month. A permanent record of the readings shall be kept.

4628 The following test method shall be used (see also 4751–4753):

(a) The floor shall be clean and dry and the room shall be free of flammable gas mixtures.

(b) Each electrode shall weigh five pounds and shall have a dry, flat, circular contact area 2½ inches in diameter, which shall comprise a surface of aluminum or tin foil 0.0005 to 0.001 inch thick, backed by a layer of rubber ¼ inch thick and measuring between 40 and 60 durometer hardness as determined with a Shore Type A durometer (ASTM D-2240–68).

(c) Resistance shall be measured with a suitably calibrated ohmmeter, which shall operate on a nominal open-circuit output voltage of 500 volts d.c. and a short-circuit current of 5 milliamperes with an effective internal resistance of 100,000 ohms ± 10 percent.

(d) Measurements shall be made at five or more locations in each room and the results averaged. For compliance with 4623, the average shall be within the limits specified *and no value shall be greater than five megohms.* For compliance with 4624, no location shall have a resistance of less than 10,000 ohms and the average for not less than five locations shall be greater than 25,000 ohms. Where resistance to ground is measured, two measurements shall be made at each location, with the average to be taken as the resistance to ground at that location. All readings may be taken with the electrode or electrodes more than three feet from any ground connection or grounded object resting on the floor.

NOTE: If the resistance changes appreciably with time during a measurement, the value observed after the voltage has been applied for about five seconds shall be considered to be the measured value.

463. Accessories.

4631. Coverings of operating tables, stretcher pads, pillows and cushions, etc., shall be fabricated from conductive materials throughout. Conductive sheeting shall be tested on a nonconductive surface. The resistance between two electrodes placed three feet apart, or as close to this distance as the size of the material will permit, on the same surface, and between two electrodes placed three feet apart, or as close to this distance as the size of the material will permit on the same surface, and between two electrodes placed in the middle of opposite surfaces, shall not exceed one megohm. Individual items covered with conductive sheeting shall be tested on a metal surface. The resistance between an electrode placed on the upper surface of the covered item and another electrode placed on the metal surface shall not exceed one megohm. Electrodes and ohmmeter used for these tests shall be of the type specified in 4628(b) and (c) respectively.

464. Interconnecting Conductive Accessories.

4641. All accessories which are required to be resilient or flexible on the anesthesia machine, and which form part of an interconnecting electrically conductive pathway, such as tubing, inhalers, rebreathing bags, headstraps, retainers, face masks, handbulbs and similar items shall be of conductive material throughout. Electric resistance of such accessories shall be not greater than one megohm when tested as specified in 4651.

NOTE: When a nonconductive endotracheal catheter is in use, the conductive path from the patient to the anesthesia machine should be maintained by the use of a conductive head strap.

4642. Tubing and connectors used for suctioning shall provide a continuous electrically conductive pathway to the vacuum bottle and to the vacuum outlet. The materials used shall be conductive throughout, or where it is necessary for visual monitoring may be of antistatic material with antistatic properties good for the specified life* of the material provided they embody a continuous integral conductive pathway designed so that in normal use the conductive pathway shall make and maintain conductive contact with conducting materials. Electric resistance of such tubing and connectors shall be not greater than one megohm when tested as specified in 465.

*"Specified life" refers to the permanence of the antistatic property with respect to the stated life of the material, including storage, and is of particular importance if the material is expected to be used and cleaned (e.g., washed) several times.

4643. All belting used in connection with rotating machinery shall have incorporated in it sufficient conductive material to prevent the development of electrostatic charges. A conductive pulley shall be used.

NOTE: The conductivity of the path from the pulley to the ground should be considered. If ball bearings are used, the contact between the balls and the races will probably be sufficient when bearings are lubricated with graphited oil or grease. If sleeve bearings are used, some means of conducting the charge from the pulley should be provided.

4644. Items which are not parts of a machine should be of conductive materials throughout, particularly where the item is depended on to provide a conductive pathway between other conductive items and/or the patient (see note after 4641). For essential elements in surgery, such as prosthetic and therapeutic devices, bacterial barriers, instruments, gloves (thermoplastic: for example, PVC), or bio-mechanical equipment, antistatic materials should be used if conductive materials are not available or impractical. Regular materials may be used in approved devices shown by test to be nonhazardous.

4645. Nonconductive, nonantistatic parts may be used where necessary as electric insulators or heat insulating handles on approved devices. Where exposed metal parts of machines of necessity are insulated from each other by other nonconductive parts, they shall be electrically interconnected. The resistance of the grounding path between these metal parts shall not exceed 0.1 ohm.

4646. Antistatic materials are not acceptable where they are relied upon to provide an interconnecting electrically conductive pathway.

NOTE: The sample is held between electrically interconnected electrodes. The 5000 volts is applied to the electrodes for 10 seconds after the indicated potential of the sample reaches equilibrium before the charge decay rate is measured.

465. Testing for Conductivity.

4651. An ohmmeter of the type specified in 4628(c) shall be used for testing. Where possible, electrodes shall be of the type to make contact with metal positions across which it is desired to ensure a conductive pathway provided by the accessory, but care must be taken to ensure that the placing of the electrodes has not inadvertently provided an alternate conductive path to that under test; or electrodes shall be of the type specified in 4628(b), where applicable; or equivalent electrode contact shall be employed as practical. All items which are parts of a machine such as tubing, bags, face masks, etc., shall be tested either in place or detached from the machine in accordance with one of the methods listed under 4652–4658.

4652. When tested in place on the machine, it is first necessary to purge the entire system of flammable or explosive gases. The anesthesia jar and cylinders of flammable gases shall be removed from the machine and all the remaining parts purged by flowing air through them in sufficient quantity to assure that all residual anesthetic gases have been removed. All parts shall be tested and each part shall be tested separately.

4653. For interconnecting parts that are to be classed as conductive throughout, one electrode shall be attached in a satisfactory manner to the metal frame of the machine, and the conductivity shall be determined by measuring the resistance between this first electrode and a second electrode consisting of a metal band snugly fitted around the midpart of the item being tested or, for face masks and similar objects, between the first electrode and a second electrode (see 4628(b)) resting on the item.

4654. For interconnecting parts that are to be classsed as

antistatic with a continuous integral conductive pathway, the conductivity test shall be performed as given in 4651 above except that, in place of the metal band electrode or the standard electrode of 4628(b), there shall be a suitable second electrode making contact with the part in a manner that simulates the actual second contact area made when the part is connected for use.

4655. Metal parts of machines which are of necessity apparently insulated from each other by other nonconductive parts, shall be suitably tested for electric interconnection; this may be an ohmmeter test. The resistance of the grounding path between these metal parts shall not exceed 0.1 ohm.

4656. When tubing and other accessories are tested for conductivity while detached from a machine, each part shall be fitted with a clean brass nipple of the same outside diameter as the connector by which the part is normally connected to the machine. A nipple shall be inserted into each such opening of the part. When two or more nipples are involved, satisfactory conductivity shall be determined by measuring the resistance between nipples. If only one nipple is involved, as in the case of a face mask or breathing bag, the resistance shall be measured between the nipple and another electrode suitably connected elsewhere (e.g., a standard electrode resting on the part).

4657. While the above are given as standard test methods, where these methods cannot be applied, an equivalent test method may be used. Interconnecting conductivity is acceptable if the measured resistance is not greater than one megohm.

4658. Conductive items containing antistatic material shall have the antistatic properties tested as given in 4663 and 4664.

466. Antistatic Accessories and Testing.

4661. For conductive accessories containing antistatic material see 4641 and 4642; the antistatic material of these accessories shall be tested as given in 4663 and 4664. For other individual items which may be of antistatic material see 4644.

4662. Plastic sheeting, film and other nontextile, nonmetal materials, if not required to form a conductive interconnecting pathway between machines, objects and persons, need not be conductive but shall be of antistatic material except as given in 4644. It shall be of antistatic material throughout its specified life when tested as given in 4663 and 4664.

4663. Antistatic sheeting, film and textiles shall meet the specified requirements of at least one of the following test methods when

preconditioned at 50% ± 2% RH at 70° ± 3.5° F for 25 hours or until equilibrium is reached, and tested at 50% ± 2% RH at 70° ± 3.5° F.

(a) Method 4046 of Federal Test Method Standard 101B. After the specimen has received its maximum charge from the application of 5000 volts, the time for the indicated specimen potential to drop to 10% of its maximum value shall not exceed ½ second.

NOTE: The static detector head should be of a type which is adequately shielded to minimize responses to potentials on the electrodes, and other stray pickup.

(b) Method 76-1969 of the AATCC (ANSI L14.112-1961). Applied voltage should be 100 volts per inch of interelectrode spacing. The measured resistivity shall be less than 1×10^{11} ohms per unit square of material.

4664. Antistatic items other than sheeting, film, and textiles shall be tested in a manner as closely as possible equivalent to that given in 4663.

467. Conductive Footwear.

4671. The resistance of any static conductive footwear or any equivalent static conductive device used in conjunction with nonconductive footwear, shall have a value before the item is first put in use, not exceeding 500,000 ohms when tested in the following manner. The static conductive shoe, or any equivalent static conductive device attached to a nonconductive shoe shall have clean contact surfaces. It shall be placed on a nonoxidizing metal plate wetted with water. A brass electrode having a contact area of one square inch shall be placed on the inside of the sole or heel of the shoe after the surface under the electrode has been wetted by water. The resistance shall be measured between the plate and the electrode using a d.c. ohmmeter supplying a potential in excess of 100 volts (e.g., see 4628(c)).

4672. In the case of static conductive booties, the test shall be made as follows: The bootie shall be laid flat on an insulating surface. Two brass electrodes, each one and one-half inches long, having a contact area of one square inch, shall be used. One electrode shall be placed on the bootie near the toe and on the part of the bootie that normally comes in contact with the floor. The other electrode shall be placed on the ankle section. The bootie shall be wetted under the electrodes only.

4673. If the tests as here described are not technically feasible for the device under consideration, an alternative equivalent means

of testing shall be used. The static conductive footwear and any static conductive device used with nonconductive footwear shall also meet, during use, the requirements of 4732, 4733, 4734 and 4763.

4674. For protection of personnel against electric shock and high frequency burns, static conductive footwear and equivalent static conductive devices shall not have any metal parts (nails, etc.) which normally come in contact with the floor.

468. Textiles. (See also 4735, 4736 and 4737.)

4681. Silk, wool synthetic textile materials, blends of synthetic textile materials with unmodified cotton or rayon, or nonwoven materials shall not be permitted in hazardous locations as outer garments or for nonapparel purposes, unless such materials have been tested and found to be antistatic by meeting the requirements of 4663.

4682. It is preferable to use only one textile material because static electricity is more readily generated by contact between articles of different materials than by contact between articles of the same material.

469. Furniture.

4691. All items of furniture constructed of metal shall meet the requirements of 3365 if applicable. If 3365 is not applicable, such furniture shall meet the requirements of 4692.

4692. If the furniture is conductive but not made of metal (see 1507), then it shall have casters, tires, or leg tips of metal, conductive rubber, or equivalent conductive material with a floor contact surface having one dimension of at least five-eighths inch. Approved equivalent means of making conductive contact between the piece of furniture and the floor is acceptable, provided the contact device is securely bonded to the piece of furniture and is of material which will not oxidize under conditions of normal use to decrease the conductivity of the circuit, and if uninterrupted contact with the floor is at least five-eighths inch in one dimension (see also 4764).

4693. Surfaces on which movable objects may be placed shall be without insulating paint, lacquer, or other nonconductive finish.

4694. The resistance between the conductive frame of the furniture referred to in 4692 and a metal plate placed under one supporting member but insulated from the floor shall not exceed 250,000 ohms, measured with an ohmmeter of the type described in 4628(c).

47. Administration and Maintenance.

471. Storage of Flammable Agents.

4711. Hospital administrative authorities, in consultation with the medical staff and others of training and expertise, shall determine the adequacy of storage space for flammable anesthetic and disinfecting agents and medicaments (see 412), and shall provide and enforce regulations for the storage and handling of containers of such agents. Said regulations also shall provide for the periodic inspection and maintenance of said storage locations.

4712. Storage locations for flammable agents shall meet the construction requirements stated in 3211, and shall be ventilated as provided in 4121.

4713. Flammable agents shall be stored only in such locations. Flammable agents shall not be stored in anesthetizing locations, other than cylinders of flammable anesthetic agents connected to a gas anesthesia apparatus.

4714. Cylinders containing flammable gases (i.e., ethylene and cyclopropane) and containers of flammable liquids (i.e., diethyl ether, divinyl ether, ethyl chloride) shall be kept out of proximity to cylinders containing oxidizing gases (i.e. oxygen or nitrous oxide) through the use of separate rooms.

4715. Storage locations of flammable agents shall be kept free of cylinders of oxygen or nitrous oxide.

4716. Sources of illumination and ventilation equipment in storage locations for flammable anesthetic agents, wherever located, and especially in storage locations which are remote from the operative suite, shall be inspected and tested on a regular schedule. Such procedures shall determine that adequate ventilation is maintained.

472. General Requirements for Flammable Anesthetizing Locations.

4721. Hospital authorities in consultation with others as noted in 4711, shall adopt regulations to control apparel and footwear allowed, the periodic inspection of conductive materials, the control of purchase of static conductive and antistatic materials, and the testing of conductive floors.

***4722.** All required precautions shall apply to all anesthetizing locations in which flammable anesthetics are used (see Appendix A4722).

4723. Hospital regulations shall be established and enforced to control the use of electronic equipment such as television equipment, diathermy equipment, public address systems, monitoring equipment, and similar electronic and high frequency apparatus in the presence of flammable agents.

4724. Hospital regulations shall prohibit the use of X-ray equipment in flammable anesthetizing locations if such equipment is not approved for operation in hazardous locations. (See 4434, 4436 and 4518.)

4725. Covers of fabric or of any form of sheeting shall not be used on anesthesia equipment capable of utilizing flammable anesthetizing agents because a cover will confine gas that may leak from a cylinder. When the cover is removed from the anesthesia machine under such conditions a static charge may be created which could ignite the gas confined beneath the cover.

4726. The use of rebreathing techniques in administering flammable anesthetic agents at all times is highly desirable. Through the use of these techniques the escape of flammable mixtures is substantially limited.

4727. Residual ether remaining in ether vaporizers at the end of each day shall be returned to original containers for disposal or laboratory use only. The ether vaporizer, container, and such shall be thoroughly washed and dried before being returned to use (see Appendix A 2321).

4728. Members of the professional staff shall be required to submit for inspection and approval any special equipment they wish to introduce into flammable anesthetizing locations (see 3776). Such equipment shall be approved for use in Class I, Group C, Division 1 hazardous locations or comply with 4515. It shall be equipped with approved cords and attachment plugs (see 3514, 3515, 3516, 4421 and 4423).

4729. High frequency electric and electronic equipment, such as electrosurgery amplifiers, monitors, recorders, television cameras, portable electrical tools, maintenance equipment, and certain sterilizing equipment which does not comply with the provisions of 4515, shall not be used when flammable anesthetic agents are being administered.

Cautery and electric surgical equipment shall not be used during procedures involving flammable anesthetic agents unless the equipment complies with the requirements of 4514 and NFPA 76CM. (See 452.)

473. Electrostatic Safeguards.

4731. Section 46 of this standard deals with the elements required to be incorporated into the structure and equipment to reduce the possibility of electrostatic spark discharges which are a frequent source of the ignition of flammable anesthetic agents. The elimination of static charges is dependent on the vigilance of administrative activities in materials, selection, maintenance supervision, and periodic inspection and testing. It cannot be too strongly emphasized that an incomplete chain of precautions will generally increase the electrostatic hazard. For example, conductive flooring (see 5114) may contribute to the hazard unless all personnel wear conductive shoes and unless all objects in the room are electrically continuous with the floor.

***4732.** All personnel entering flammable anesthetizing locations, mixed facilities or storage locations for flammable anesthetics located in the surgical suite shall be in electrical contact with the conductive floor through the wearing of conductive footwear or an alternative method of providing a path of conductivity. The provision of conductive floors in corridors and rooms directly communicating with flammable anesthetizing locations (see 5114), will minimize the possibility of static discharge from patients or personnel entering such anesthetizing locations (see Appendix A 4732).

4733. Electric connection of the patient to the operating table shall be assured by the provision of a high impedance strap in contact with the patient's skin, with one end of the strap fastened to the metal frame of an operating table meeting the requirements of 364.

4734. Because of the possibility of percussion sparks, shoes having ferrous nails which may make contact with the floor shall not be permitted in flammable anesthetizing locations or mixed facilities nor in storage locations for flammable anesthetics agent in the surgical suite.

4735. Silk, wool or synthetic textile materials, except rayon, shall not be permitted in flammable anesthetizing locations or mixed facilities as outer garments or for nonapparel purposes, unless these materials have been approved as antistatic in accordance with the requirements of 4663 and 4664.

NOTE: Rayon refers to regenerated cellulose and not cellulose acetate: Cotton and rayon must be unmodified; i.e., must not be glazed, permanently starched, acetylated, or otherwise treated to reduce their natural hygroscopic quality. Fabrics of intimate blends of unmodified cotton or rayon with other textile materials are not acceptable unless tested and found to be antistatic.

4736. Hosiery and underclothing in which the entire garment is in close contact with the skin may be of silk, wool, or synthetic material.

4737. Undergarments with free hanging skirts, such as slips or petticoats must be of cotton, rayon, or other materials demonstrated to be antistatic by the requirements of 4663 and 4664.

4738. It is recommended that antistatic materials for use in flammable anesthetizing locations be handled and used in the following manner: (see also Note under 4642).

a. Antistatic materials should be stored at the temperature and humidity required for flammable anesthetizing locations or they should be allowed to equilibrate to the humidity and temperature of the flammable anesthetizing location prior to use.

b. Antistatic materials should be stored in such a manner that will insure that the oldest stocks will be used first.

c. Controls should be established to insure that manufacturers' recommendations as to use are followed in the case of antistatic materials.

4739. All conductive accessories intended for replacement, including belting, rubber accessories, plastics, sheeting and the like, shall meet pertinent requirements for conductivity as specified in 4663(b).

474. Discretionary Use of Nonconforming Materials.

4741. Suture material, alloplastic or therapeutic devices, bacterial barriers, instruments, gloves (thermoplastic), surgical dressings, and biologic interfaces of these otherwise prohibited materials may be used at the discretion of the surgeon.

4742. Disposable supplies which contribute to the electrostatic hazard, shall be so labeled on the unit package.

475. Maintenance of Conductive Floors.

4751. The surface of conductive floors shall not be insulated by a film of oil or wax. Any waxes, polishes, or dressings used for maintenance of conductive floors shall not adversely affect the conductivity of the floor.

4752. Floors which depend upon applications of water, salt solutions, or other treatment of a nonpermanent nature for their conductivity are not acceptable.

4753. Cleaning procedures for conductive floors shall be established, then carefully followed to assure that conductivity characteristics of the floor are not adversely affected by such treatment.

4754. Conductive floors shall be tested as specified in 462.

476. Other Conductive Equipment.

4761. The resistance of conductive accessories shall be tested prior to use as described in 4631 or 4641. Thereafter, measurements shall be taken at intervals of not more than one month. A permanent record of the readings shall be kept.

4762. Antistatic plastics shall meet the requirements of 4661. It shall be the responsibility of the hospital to ensure that antistatic sheeting, etc., is used in accordance with the manufacturer's instructions. Failure to do so could in some cases lead to loss of antistatic properties. Antistatic materials which are reused (e.g., such as antistatic tubing incorporating a continuous conductive pathway as described in 4641) shall be tested (see 4661) periodically to ensure retention of conductive properties.

4763. Conductive footwear and other personnel-to-floor connective devices shall be tested on the wearer each time they are worn. An approved resistance measuring device having a short-circuit current not exceeding 0.5 milliamperes shall be used.

NOTE: The reading may be taken between two insulated, non-oxidizing, metal plates so located that the wearer can stand in a normal manner with a foot on each, in which case the indicated resistance shall not exceed 1,000,000 ohms (1 megohm). (See also A 4732–4734.)

4764. The resistance of furniture (see 364 and Appendix A 3641) and equipment shall be tested prior to use as described in 4694. Thereafter, measurements shall be taken at intervals of not more than one month. A permanent record of the readings shall be kept. The monthly tests can conveniently consist of measurements of the resistance between an electrode placed on the floor and an electrode placed successively on each article of furniture in the room. Additional tests of any individual item shall be made if the measured resistance exceeds five megohms.

4765. Periodic inspection shall be made of leg tips, tires, casters, or other conductive devices on furniture and equipment to insure that they are maintained free of wax, lint or other extraneous material which may insulate them and defeat the purpose for which they are used; also to avoid transporting to conductive floors such materials from other areas.

4766. Excess lubrication of casters shall be avoided to prevent accumulation of oil on conductive caster wheels and sides. Dry graphite or graphited oil are preferable lubricants.

Part V

Nonflammable Anesthetizing Locations

5111. Requirements contained in this part are in addition to those contained in Part III.

5112. All nonflammable anesthetizing locations, whether located in a mixed facility, shall be identified by prominently posted signs at all entrances to the operating room and within the location signifying the type of anesthetics permitted.

NOTE: Suggested explanatory text of such a sign is as follows: RESTRICTED TO NONFLAMMABLE ANESTHETIC AGENTS

5113. Each operating suite containing only nonflammable anesthetizing locations shall contain prominently posted regulations similar to those contained in Appendix B, set (2).

5114. Flooring in nonflammable anesthetizing locations is not required to be conductive. If conductive flooring is used the resistance shall comply with 4622–4626.

NOTE: In regions in which climatic conditions favor the accumulation of static electricity, the installation of conductive flooring may be desirable to avoid the danger of involuntary movements associated with static discharges.

5115. NONFLAMMABLE ANESTHETIZING LOCATIONS: The requirements of 473 do not apply in nonflammable anesthetizing locations, but the considerations required in 3641, 3642 and 3643 should be consulted in determining policy.

5116. Each operating or delivery suite containing both flammable and nonflammable anesthetizing locations shall be considered a mixed facility (see 150). Provisions governing mixed facilities are covered in Part VI of this standard.

Part VI

Mixed Facilities

611. General.

6111. The mixed facility is defined in 150.

612. Construction of Anesthetizing Locations and Storage Locations.

6121. Flammable Anesthetizing Locations (see 150) shall be designed, constructed and equipped as stated in Parts III and IV of this standard.

6122. The requirements for Nonflammable Anesthetizing Locations are stated in Parts III and V of this standard.

6123. Storage locations for flammable agents shall be constructed as provided in 412. Storage locations for nonflammable medical gas cylinders shall be constructed as provided in 321.

613. Precautionary Signs.

6131. The entrances to all operating rooms, shall be identified by prominently posted signs denoting individually whether the anesthetizing location is designed for flammable anesthetic agents or for nonflammable anesthetic agents.

NOTE: Suggested explanatory texts of such signs are as follows:

CAUTION
FLAMMABLE ANESTHETICS
OBEY ALL SAFETY REGULATIONS

or

RESTRICTED TO NONFLAMMABLE ANESTHETIC AGENTS

6132. Signs similar to those noted in 6131 also shall be posted prominently within the rooms themselves.

6133. Regulations for the conduct of personnel, administration and maintenance in mixed facilities shall be posted in at least one prominent location within the operating, and, if applicable, delivery suite. (See 37333) Suggested text of such regulations is contained in Appendix B, set (3).

614. Movable Equipment and Furniture.

6141. All equipment intended for use in both flammable and

nonflammable anesthetizing locations shall meet the antistatic requirements of 46.

6142. Equipment intended for use only in nonflammable anesthetizing locations shall be labeled in accordance with 4511, and shall not be introduced into flammable anesthetizing locations.

6143. Portable X-ray equipment shall not be introduced into mixed facilities unless it complies with requirements of 4513 and is approved for use in Class 1, Group C, Division 1 hazardous locations.

6144. Portable electric equipment shall meet the requirements for hazardous locations.

6145. Portable electric equipment, such as incubators, lamps, heaters, motors and generators used in mixed facilities in which anesthesia equipment is present or in operating condition shall comply with the requirements of Articles 500, 501 and 517 of NFPA No. 70–1971 for Class I, Division 1 locations and shall be approved for Class I, Group C, Division 1 hazardous locations, except as permitted in 4516.

NOTE: The resistance and capacitive reactance between the conductors and the noncurrent-carrying metallic parts must be high enough to permit the use of the equipment on an ungrounded distribution system having a line isolation monitor specified in 334. See 76B-T.

6146. Furniture used in a mixed facility shall comply with the provisions of 469.

APPENDIX A.

Explanatory Statements

The following explanatory statements are presented to be of assistance in the understanding of the foregoing standard for the use of flammable and nonflammable anesthetics. The sub-divisions of the appendix are numbered to correspond with the section numbers of the standard.

A 150. Hazardous Locations in Flammable Anesthetizing Locations.

The definition in 150 of this standard is based upon the following considerations:

(a) Available data and recent investigations indicate that under customary operating procedures, flammable anesthetic mixtures are diluted by air in the anesthetizing area to a nonflammable range before reaching a vertical height of one foot from any source of leakage or spillage involving quantities of anesthetics used in anesthesia procedures. These findings corroborate the premises on which safeguards required in this code were originally based and do not negate the need for any of the protective measures required; however, they do provide a sound basis for the statement that recirculation of air in ventilating systems serving anesthetizing locations does not increase the hazards of fire and explosions from flammable anesthetic vapors.

(b) The mobile character of the operating room table and portable equipment and the variety of the surgeon's techniques and surgical positions that will alter the physical relationship of the anesthesia gas machine, the surgeon, the anesthetist, and the patient's head, and all of these with respect to their relative location within the room, must be considered in the determination of the electrical safeguards to be provided.

(c) The portion of the flammable anesthetizing location extending five feet above the floor as defined in 150 constitutes a "hazardous location". Because persons entering such anesthetizing locations may have accumulated electrostatic charges, the floor of corridors and rooms contiguous to the flammable anesthetizing location must be conductive and at the same potential as the floor in the flammable anesthetizing location. Patients should not be transported while flammable anesthetics are being administered. Rooms such as sterilizing rooms directly communicating with flam-

mable anesthetizing locations are required by 4612 to be provided with conductive floors to equalize static charges. Such rooms, if not used as flammable anesthetizing locations, are not required to be served by explosion-proof wiring specified in 4411. Where flammable anesthetizing locations open directly on a passageway not a part of an operating room or delivery room, the conductive floor should extend ten feet either side of the door frame and the width of the passageway or 10 feet. It is desirable to demarcate the hazardous location of such a corridor by a physical barrier (doors) and cautionary signs to check smoking, use of open flame, wearing of improper clothing and shoes, and the application of insulating floor wax.

(d) Designated areas in which the use and handling of flammable anesthetic agents are prohibited by hospital regulations, such as corridors in the surgical suite and rooms adjacent to flammable anesthetizing locations and nonflammable anesthetizing locations should be indicated by prominent signs permanently installed. (See Appendix A 4722.)

(e) Post-operative recovery units which are not immediately adjacent to flammable anesthetizing locations and in which the use of flammable anesthetic agents is prohibited are not considered to involve explosion hazards and therefore do not require the installation of static-dissipation systems nor explosion-proof equipment required for explosive atmospheres. Prohibition of the use of flammable anesthetic agents by hospital regulation and the proper indication of such prohibition by prominent signs, as recommended in subsection (c) above, is recommended.

A 2311. It is possible to halogenate a compound, and render it partially or totally nonflammable by the substitution of one or more halogens (e.g. fluorine, chlorine, bromine) for hydrogen. Thus halothane ($CF_3CHClBr$) is almost completely halogenated and is nonflammable. Methoxyflurane ($CF_2CCl_2OCH_3$) is partially halogenated and is nonflammable in conditions which are encountered during clinical anesthesia (if it is heated its vapor concentration will increase enough to burn). Fluroxene ($CF_3CH_2OCHCH_2$) is halogenated even less; it is flammable in concentrations of four percent or greater.

The following agents are considered flammable during conditions of clinical use in anesthesia:

cyclopropane	ethylene
divinyl ether	ethyl ether
ethyl chloride	

The following agent is flammable during use in clinical anesthesia in higher concentrations:

fluroxene

NOTE: Because fluroxene is flammable under certain conditions of use, it is listed as a flammable agent in Appendix B. Concentrations required for induction of anesthesia generally exceed four percent, and are flammable. Maintenance of fluroxene anesthesia may be accomplished with concentrations of less than four percent, however. See also Section 343.

The following agents are nonflammable during conditions of use in clinical anesthesia:

chloroform
halothane
methoxyflurane
nitrous oxide
trichloroethylene

A 2331. The Committee on Hospitals is cognizant of suggestions that the detonation of ether peroxides formed by the oxidation of ether over a period of time may be a cause of explosions in anesthesia machines. Frequent emptying of the ether bottle and cleaning of the ether evaporator inside anesthetizing locations is a simple and desirable precaution.

Many types of hospital construction afford reasonable protection against lightning hazards. However, because of the storage and use of combustible anesthetic agents, the increased protection offered by the installation of lightning rods may be desirable for some types of buildings, particularly those of wood (frame) construction in outlying areas. Lightning protection, if installed, should conform to the requirements of the NFPA Lightning Protection Code, No. 78.*

A 311. Ventilation of Anesthetizing Locations.

Mechanical ventilation is required as a means of diluting flammable gases and maintaining the proper humidity. It is also the most effective and aseptic method of maintaining a uniform humidity within the area.

General: Anesthetizing locations used solely for the induction of anesthesia need only be ventilated at a rate sufficient to maintain the proper humidity.

Anesthetizing locations in which clinical procedures are performed, such as operating rooms, delivery rooms, and certain treatment rooms, require special ventilation as described below. This

*See Appendix C for availability.

special ventilation serves not only to maintain humidity but also reduces the hazard of infection which is accomplished by dilution and removal of airborne microbial contamination and dilutes flammable gases. It also contributes to odor control and comfort of personnel.

The Committee recognizes that a hazard may be created by the chronic exposure of anesthesia and other operating room personnel to low concentrations of vapors of commonly employed volatile liquid inhalation anesthetic agents. See Cohen, E. N. et al: Anesthesia, pregnancy and miscarriage; a study of operating room nurses and anesthetists. Anesthesiology 35: 343, 1971; Whitcher, C. E. et al: Chronic exposure to anesthetic gases in the operating room. Anesthesiology 35: 348, 1971.

One solution to this potential and serious problem would be the venting of exhaled and escaping anesthetic vapors to the outside. Care must be taken in the application of any such system to a gas anesthesia apparatus to avoid exposing the breathing circuit to any pressures less than atmospheric, and also to avoid the dumping of any flammable vapors into a central suction system.

Operating Rooms, Delivery Rooms, and Special Procedure Rooms: Ventilation air should be supplied from several outlets located on the ceiling or high on the walls of the location. Air should be exhausted by several inlets located near the floor on opposite walls. The air distribution pattern should move air down and through the location with a minimum of draft to the floor for exhaust.

Studies indicate that an air change rate equivalent to 25 room volumes of air per hour dilute bacteria dispersed into the room by human activity. When properly filtered, 80 percent may be recirculated with no more microbial contamination than 100 percent outdoor air filtered in the same manner. (See ASHRAE Guide and Data Book-Applications, Chapter 14, Table on "Pressure Relationships and Ventilation of Certain Hospitals Areas".)

A positive air pressure relative to the air pressure of adjoining areas should be maintained in the anesthetizing location. This is accomplished by supplying more air to the location than is exhausted from it. Such pressurization will eliminate the infiltration of contaminated air around perimeter openings of door closures or other wall openings during clinical procedures.

Ventilation systems should incorporate air filters with an efficiency of not less than 90 percent when tested in accordance with methods for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter, ASHRAE Standard 52-68 (Summarized in ASHRAE Guide and Data Book, Equipment, 1969, Chapter 10).

Humidity Control: The ventilation system must incorporate humidity equipment and controls to maintain 50 percent relative humidity. Although it is not sufficiently reliable for complete dissipation of electrostatic charges, this humidity does reduce the hazard of electrostatic spark discharges under many conditions. The control of airborne bacteria is facilitated in this range of humidity.

Temperature: The temperature to be maintained in operating rooms should be chosen on the basis of the well-being of patient and operating team. It is recommended that the equipment provide for a room temperature in a range of 68° F. to 75° F. with controls for selecting any desired temperature within this range.

A 3225. Pin-Index Safety System.

The Pin-Index Safety System consists of a combination of two pins projecting from the yoke assembly of the apparatus and so positioned as to fit into matching holes drilled into the cylinder valves. It is intended to provide against the possibility of error in attaching the flush-type valves, with which gas cylinders and other sources of gas supply are equipped, to gas apparatus having yoke connections.

Fabrication specifications are contained in American National Standard B57.1, Compressed Gas Cylinder Valve Outlet and Inlet Connections.* Connection No. 860 shown in Figure A3225 illustrates the System. Connections Nos. 870 (Oxygen, Medical), 880 (Oxygen-Carbon Dioxide Mixture), 890 (Oxygen-Helium Mixture), 900 (Ethylene), 910 (Nitrous Oxide), 920 (Cyclopropane), 930 (Helium), and 940 (Carbon Dioxide) are for specific medical gases and gas mixtures and utilize the basic dimensions of Connection 860.

*See Appendix C for availability.

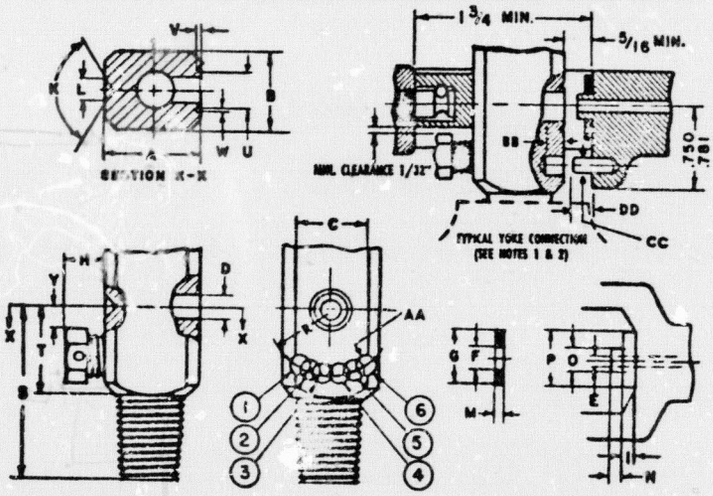
COMPRESSED GAS ASSOCIATION, INC.
NEW YORK, N. Y.

CONNECTION NO. 860

YOKE OUTLET FOR MEDICAL GASES

STANDARD FLUSH OUTLET CYLINDER VALVE YOKE CONNECTION

BASIC DIMENSIONS FOR CONNECTION NUMBERS 870 THRU 940, INCLUSIVE



VALVE OUTLET NO. 861

MAJOR WIDTH	A	1"±1/64"
MINOR WIDTH	B	7/8"±1/64"
FACE	C	5/8" MIN.
BORE DIA.	D	.275"-.284"
COUNTERSINK ANGLE	K	100°-120°
COUNTERSINK DIA.	L	13/64"-1/4"
MINOR GROOVE, DIA.	U	.370"-.380"
GROOVE, WIDTH	W	.030" MAX.
GROOVE, DEPTH	V	.030" MAX.
DISTANCE	S	1-11/16" MIN.
DISTANCE	T	13/16" MIN.
CLEARANCE	Y*	5/16" MIN.
PROJECTION	H*	3/8" MAX.
HOLE DIA.	AA	.1870"-.1910"
HOLE DEPTH	BB	7/32" +3/32"
RADIUS	R	9/16" (REF.)

WASHER NO. 865

DIAMETER	G	5/8"±1/64"
HOLE	F	.245"-.261"
THICKNESS	M	1/16"±1/64"

NIPPLE NO. 863

HOLE DIA.	S	3/32"±1/32"
NOSE DIA.	O	.215"-.235"
NOSE LENGTH	N	.140"-.170"
SHOULDER DIA.	P	5/8" MIN.
SHOULDER LENGTH	E	TO FIT YOKE
PIN DIA.	CC	.155"-.157"
PIN LENGTH	DD	7/32" +0 -1/32"

NOTE 1 – YOKE OR STABILIZER SHALL BE SO DIMENSIONED TO LIMIT ITS ROTATION ON THE VALVE TO ± 6 DEGREES.

NOTE 2 – 1-3/4" MAY BE REDUCED TO 1-3/8" IF CLEARANCE IS PROVIDED FOR PROJECTING SAFETY NUT.

*APPLICABLE ONLY IF PROJECTING TYPE SAFETY IS USED

§Must be central within .010." Break sharp edge on outlet hole and gasket groove.

Fig. A3225

A 3311. Arrangement of Circuits.

The ungrounded electrical distribution system specified in 3311 is intended to reduce the possibility of electric shocks and recurring arcs and sparks in the event of insulation failure of the electrical wiring system in anesthetizing locations. Because of the difficulty of achieving a sufficiently high level of insulation to permit operation of a ground indicator, an exception has been made so that permanently installed X-ray equipment and nonadjustable lighting fixtures need not be supplied by the ungrounded system, if the equipment and fixtures (except the X-ray tube head and cable) are located above the eight-foot level and the control switches are located outside the anesthetizing location. Such circuits may not be operated by a switch within the room connected to the grounded circuit, unless the switch is a remote control device which is connected to an ungrounded circuit.

It is recommended that a separate isolating transformer and ground indicator be used for each room of anesthetizing locations, so that ground alarms in one room do not disturb persons in other rooms. In any event, the rated capacity and the number of circuits connected to each transformer must be small enough that normal capacitance and leakage currents from the system to ground do not prevent proper operation of the ground indicator.

NOTE: Call systems, public address systems, special clock circuits, etc., are normally supplied from ungrounded systems. Unless such systems are supplied by the conventional types of branch circuits, they are not considered to be within the scope of 311. Faults may occur on such systems which will not record on the audible and visible signal required (see 3342) but the usual location of clocks, loud speakers, call bells, etc., is well above the five-foot limitation for the hazardous location (see 15–Definitions) and if these devices are enclosed in comparatively tight enclosures, the possibility of hot particles falling into the hazardous location is remote. Should such equipment be installed within the hazardous location (see 213), the special precautions for such areas must be followed.

While a current from either isolated conductor to ground of as much as two milliamperes is permitted in 3342, when conductors are grounded it is desirable to design the detector with as small a ground current as is feasible, since this current can also contribute to the electric shock hazard in instances where conductive probes or catheters, filled with conductive fluid are inserted into the heart or great vessels.

A 364. In its requirement for furniture in a flammable anesthetizing location to be constructed of conductive materials, the Committee specifically intends that any shelves within such furniture as well as the top shall also be conductive. Furniture is intended to include movable and permanently installed objects in the room, such as stools, tables and cabinets.

A 3737. Hazards during transport of anesthetized patients: Transportation of patients while an inhalation anesthetic is being administered from a machine separate from the table supporting the patient has resulted in injury or death of patients. Two hazards have been recognized: significant accumulation of electrostatic charge and mechanical disruption of the anesthesia circuit. Respiratory tract damage has resulted due to tugging of indwelling tubes when the anesthesia machine was not moved with the operating table. Asphyxiation resulted when the rebreathing tubes became detached and were reconnected to the wrong nipples.

A 375. Safe Practice for Cylinders Containing Compressed Gases.

Specifications for Cylinders. All cylinders containing compressed gases, such as anesthetic gases, oxygen, or other gases used for medicinal purposes, whether these gases be flammable or not, shall comply with the specifications and shall be maintained in accordance with regulations of the U.S. Department of Transportation.*

A 3783. Grounding: Patient protection is provided primarily by an adequate grounding system. The ungrounded secondary of the isolation transformer reduces the cross-sectional area of grounding conductors necessary to protect the patient against voltage resulting from fault current by reducing the maximum current in case of a single probable fault in the grounding system. The Line Isolation Monitor is used to provide warning when a single fault occurs. Excessive current in the grounding conductors will not result in a hazard to the patient unless a second fault occurs. If the current in the grounding system does not exceed ten milliamperes, even under fault conditions, the voltage across 10 feet of #12 AWG wire will not exceed 0.2 millivolt, and the voltage across ten feet of #18 A.W.G. grounding conductor in a flexible cord will not exceed 0.8 millivolt. Allowing 0.1 millivolt across each connector, the voltage between two pieces of patient-connected equipment will not exceed two millivolts.

The Patient Ground Point and grounding connections to it are intended to assure that any first fault on the isolated system will be detected while the patient and staff are still protected from excessive voltage as described above. Prompt location of the fault should be made to maintain the integrity and usefulness of this system.

The Room Ground Point is intended to assure that all electrically conductive surfaces of the building structure, which may

*See Appendix C for availability.

receive heavy fault currents from ordinary (grounded) circuits, are grounded in a manner to bypass these heavy currents from the operating room.

A 462. Conductive Flooring.

A conductive floor serves as a convenient means of electrically connecting persons and objects together to prevent the accumulation of electrostatic charges.

A resistance not exceeding fifty megohms between objects or persons is generally sufficient to prevent accumulation of dangerous voltages. The upper limit of 1,000,000 ohms for the resistance of the floor has been chosen as meeting this requirement with a reasonable factor of safety and with reasonable provision for other resistances in the conductive path.

The resistance of some flooring materials changes with age. Floors of such materials should have an initial resistance that permits changes in resistance with age without exceeding the limits prescribed in 4623 and 4624.

The grounding of the conductive floor to the room grounding point is now required to reduce the shock hazard to the electrically susceptible patient.

A 4722. The use of flammable anesthetic agents is not uncommon in such areas as in cystoscopy rooms and in emergency units. Such areas must be properly equipped for safe administration of flammable agents, and administrative regulations must apply unless the use of flammable anesthetics in the area is specifically prohibited by an official and specific resolution of the governing board of the hospital, and a conspicuous sign detailing the prohibition is posted in the area.

A 4732. Personnel.

One method for electrically connecting all persons to conductive floors is through the wearing of shoes conforming to the following specifications:

> Each shoe having a sole and heel of conductive rubber, conductive leather, or equivalent material, should be so fabricated that the resistance between a metal electrode placed inside the shoe and making contact with the inner sole equivalent in pressure and area to normal contact with the foot, and a metal plate making contact with the bottom of the shoe, equivalent in pressure and area to normal contact with the floor, shall be not more than 250,000 ohms.

APPENDIX B

SET (1)

REGULATIONS FOR SAFE PRACTICE IN FLAMMABLE ANESTHETIZING LOCATIONS

The following rules and regulations have been adopted by the Medical Staff and by the Administration. NFPA No. 56A and No. 76B-T shall apply in all anesthetizing locations.

....

(Insert Date) (Insert Name of Hospital Authority)

By reason of their chemical compositions, the following flammable anesthetic agents present a hazard of explosion in anesthetizing locations:

CYCLOPROPANE	FLUROXENE
DIVINYL ETHER	ETHYL CHLORIDE
ETHYL ETHER	ETHYLENE

REGULATIONS

1. Flammable Anesthetizing Location

(a) **Definition:** The term flammable anesthetizing location shall mean any area of the hospital where flammable anesthetic agents may be administered.

2. Equipment

(a) No electrical equipment except that judged by the Engineering Department of ..... Hospital as being in compliance with NFPA No. 56A and No. 76B-T shall be used in any flammable anesthetizing location.

(b) When a physician wishes to use his personal electrical equipment, it shall first be inspected by the Engineering Department and if judged to comply with NFPA No. 56A and 76B-T, be so labelled.

(c) Portable X-ray equipment used in flammable anesthetizing locations shall be approved for use in hazardous areas.

(d) Only approved photographic lighting equipment shall be used in flammable anesthetizing locations. Because of occasional bursting of bulbs, suitable enclosures shall be used to prevent sparks and hot particles from falling into the hazardous area.

(e) Covers shall not be used on anesthesia machines designed for flammable anesthetic agents.

3. Personnel

(a) Outer garments worn by the operating room personnel and visitors shall not include fabrics of silk, wool, or synthetic textile materials such as nylon, polyester, acrylic or acetate, unless such fabrics have been tested and found to be antistatic in accordance with the requirements of NFPA No. 56A.

(b) Silk, wool, or synthetic textile materials, except untreated rayon, shall not be permitted in anesthetizing locations as outer garments, or for nonapparel purposes, unless such fabrics have been tested and found to be antistatic in accordance with the requirements of NFPA No. 56A. Hosiery and underclothing in which the entire garment is in close contact with the skin may be of silk, wool or synthetic material.

(c) All personnel and visitors entering flammable anesthetizing locations shall wear conductive footwear or other floor contacting devices which shall have been tested on the wearer and found to be satisfactorily conductive.

(d) It shall be the responsibility of each individual entering a flammable anesthetizing location to determine at least once daily that he is in electrical contact with the conductive floor. Apparatus for testing shall be available.

(e) Moving of patients from one area to another while a flammable anesthetic is being administered shall be prohibited.

(f) Smoking shall be limited to dressing rooms and lounges with the doors leading to the corridor closed.

4. Practice

(a) Flammable anesthetic agents shall be employed only in flammable anesthetizing locations.

(b) Woolen and synthetic blankets shall not be permitted in flammable anesthetizing locations.

(c) Electrical connection of the patient to the conductive floor shall be assured by a low impedance conductive strap in contact with the patient's skin with one end of the strap fastened to the metal frame of an operating table or shall be electrically interconnected by other means.

(d) If cautery, electrosurgery or other electrical equipment employing an open spark is to be used during an operation, flammable anesthetics shall not be used unless the patient's life would be jeopardized by the selection of other anesthetic agents in the combined judgement of the surgeon performing the operation and the anesthesiologist responsible for administration of the anesthetic. Flammable germicides or flammable fat solvents shall not be applied for the preoperative preparation of the field.

(e) When the ground contact signal (red light) lights and/or the audible warning sounds, the administration of flammable anesthetic agents shall be discontinued when feasible. Following the completion of the operation the operating room in which the signal functioned shall not be used until a report has been received from the Engineering Department that the electrical defect has been remedied.

5. Enforcement

It shall be the responsibility of ..... (an anesthesiologist or other
(name)
qualified person appointed by the hospital authority to act in that capacity) to enforce the above regulations.

SET (2)

REGULATIONS FOR SAFE PRACTICE IN NONFLAMMABLE ANESTHETIZING LOCATIONS

The following rules and regulations have been adopted by the Medical Staff and Administration: NFPA No. 56A and No. 76B-T shall apply in all anesthetizing locations.

....
(Insert Date) (Insert Name of Hospital Authority)

The use or storage of any of the following mentioned flammable agents or germicides shall be prohibited from *all* operating rooms, delivery rooms and other anesthetizing locations in this hospital.

By reason of their chemical composition, these agents present a hazard of fire or explosion:

CYCLOPROPANE	FLUROXENE
DIVINYL ETHER	ETHYL CHLORIDE
DIETHYL ETHER	ETHYLENE

1. Nonflammable Anesthetizing Location

(a) **Definition:** The term Nonflammable Anesthetizing Location shall mean any anesthetizing location permanently used for or intended for the exclusive use of nonflammable anesthetizing agents.

2. Equipment

(a) No electrical equipment except that judged by the Engineering Department of ..... Hospital as being in compliance with NFPA No. 56A and No. 76B-T shall be used in any anesthetizing location.

(b) When a physician wishes to use his personal electrical equipment, it shall first be inspected by the Engineering Department and if judged to comply with NFPA No. 56A and No. 76B-T, be so labelled.

(c) Photographic lighting equipment shall be of the totally enclosed type or so constructed as to prevent the escape of sparks or hot metal particles.

3. Personnel

Smoking shall be limited to dressing rooms and lounges with doors leading to the corridor closed.

4. Practice

(a) The use or storage of flammable anesthetic agents shall be expressly prohibited in a nonflammable anesthetizing location.

(b) If cautery, electrosurgery, or other hot or arcing device is to be used during an operation, flammable germicides or flammable fat solvents shall not be applied for preoperative preparation of the skin.

(c) When the ground contact signal (red light) and/or the audible warning sounds, the administration of the anesthetic shall be discontinued when feasible. Following the completion of the operation, the operating room in which the signal functioned shall not be used until a report has been received from the Engineering Department that the electrical defect has been remedied.

(d) Transportation of patients while an inhalation anesthetic is being administered by means of a mobile anesthesia machine shall be prohibited, unless deemed essential for the benefit of the patient in the combined judgement of the surgeon and anesthetist.

(e) If in the combined judgement of the anesthesiologist responsible for the administration of the anesthetic and the surgeon performing the operation, the life of the patient would be jeopardized by not administering a flammable anesthetic agent the following steps shall be taken:

(1) Both surgeon and anesthesiologist involved in the case shall attest to the reason for administering a flammable anesthetic in a nonflammable anesthetizing location on the patient's record and in the operating room register.

(2) The hazard of static sparks shall be reduced by electrically interconnecting the patient, operating room table, anesthesia gas machine, and anesthesiologist by wet sheets or other conductive materials. Conductive accessories shall be used for the electrically conductive pathways from the anesthesia gas machine to the patient.

(3) If cautery, electrosurgery or other electrical equipment employing an open spark is to be used during an operation, flammable anesthetics shall not be used unless the patient's life would be jeopardized by the selection of other anesthetic agents in the combined judgement of the surgeon performing the operation and the anesthesiologist responsible for administration of the anesthetic. Flammable germicides or flammable fat solvents shall not be applied for the preoperative preparation of the field.

5. Enforcement.

It shall be the responsibility of .....(an anes-
(name)
thesiologist or other qualified person appointed by the hospital authority to act in that capacity) to enforce the above regulations.

SET (3)

REGULATIONS FOR SAFE PRACTICE IN MIXED FACILITIES

The following rules and regulations have been adopted by the Medical Staff and by the Administration. NFPA No. 56A and No. 76B-T shall apply in all anesthetizing locations. This hospital is a Mixed Facility. Personnel are cautioned as to the existence of both flammable and nonflammable anesthetizing locations within this hospital building and the different practices which apply to each location.

....
(Insert Date) (Insert Name of Hospital Authority)

By reason of their chemical composition, these flammable anesthetic agents present a hazard of explosion in anesthetizing locations:

CYCLOPROPANE	FLUROXENE
DIVINYL ETHER	ETHYL CHLORIDE
ETHYL ETHER	ETHYLENE

REGULATIONS

1. Mixed Facility

(a) **Definition.** The term Mixed Facility shall mean a hospital wherein flammable anesthetizing locations and nonflammable anesthetizing locations co-exist within the same building allowing interchange of personnel and equipment between flammable and nonflammable anesthetizing locations.

(b) **Definition.** The term flammable anesthetizing location shall mean any area of the hospital where flammable anesthetic agents may be administered.

(c) **Definition.** The term nonflammable anesthetizing location shall mean any anesthetizing location permanently used for or intended for the exclusive use of nonflammable anesthetizing agents.

2. Equipment

(a) No electrical equipment except that judged by the Engineering Department of ..... Hospital as being in compliance with NFPA No. 56A and No. 76B-T shall be used in any flammable anesthetizing location.

(b) When a physician wishes to use his personal electrical equipment, it shall first be inspected by the Engineering Department and if judged to comply with NFPA No. 56A and No. 76B-T, be so labelled.

(c) Portable X-ray equipment used in flammable anesthetizing locations shall be approved for use in hazardous areas.

(d) Only approved photographic lighting equipment shall be used in flammable anesthetizing locations. Because of occasional bursting of bulbs, suitable enclosures shall be used to prevent sparks and hot particles from falling into the hazardous area.

(e) Covers shall not be used on anesthesia machines designed for flammable anesthetic agents.

(f) All portable electrical equipment shall meet the requirements for flammable anesthetizing locations.

3. Personnel

(a) Outer garments worn by the operating room personnel and visitors in mixed facilities shall not include fabrics of silk, wool, or synthetic textile materials such as nylon, polyester, acrylic or acetate, unless such fabrics have been tested and found to be antistatic in accordance with the requirements of NFPA No. 56A.

(b) Silk, wool, or synthetic textile materials, except untreated rayon, shall not be permitted in mixed facilities as outer garments, or for nonapparel purposes, unless such fabrics have been tested and found to be antistatic in accordance with the requirements of NFPA No. 56A. Hosiery and underclothing in which the entire garment is in close contact with the skin may be made of silk, wool or synthetic material.

(c) All personnel and visitors entering all anesthetizing locations in mixed facilities shall wear conductive footwear or other floor contacting devices which shall have been tested on the wearer and found to be satisfactorily conductive.

(d) It will be the responsibility of each individual entering an anesthetizing location of a mixed facility to determine at least once daily that he is in electrical contact with the conductive floor. Apparatus for testing shall be available.

(e) Moving of patients from one area to another while a flammable anesthetic is being administered shall be prohibited.

(f) Smoking shall be limited to dressing rooms and lounges with the doors leading to the corridor closed.

4. Practice

(a) Flammable anesthetic agents shall be employed *only* in flammable anesthetizing locations.

(b) The administration or the intended administration of a flammable anesthetic agent shall be brought to the attention of all personnel within the flammable anesthetizing location by verbal communication by the anesthesiologist and by posting prominent signs in the operating room and at all entrances to the operating room stating that a flammable anesthetic agent is in use.

(c) Woolen and synthetic blankets shall not be permitted in anesthetizing locations.

(d) Electrical connection of the patient to the conductive floor in a flammable anesthetizing location shall be assured by a low impedance conductive strap in contact with the patient's skin with one end of the strap fastened to the metal frame of an operating table or shall be electrically interconnected by other means.

(e) If cautery, electrosurgery or other electrical equipment employing an open spark is to be used during an operation, flammable anesthetics shall not be used unless the patient's life would be jeopardized by the selection of other anesthetic agents in the combined judgement of the surgeon performing the operation and the anesthesiologist responsible for administration of the anesthetic. Flammable germicides and flammable fat solvents shall not be applied for the preoperative preparation of the field.

(f) If in the combined judgement of the anesthesiologist responsible for the administration of the anesthetic and the surgeon performing the operation, the life of the patient would be jeopardized by not administering a flammable anesthetic agent in a nonflammable anesthetizing location, the following steps shall be taken:

(1) Both surgeon and anesthesiologist involved in the case shall attest to the reason for administering a flammable anesthetic in a nonflammable anesthetizing location on the patient's record and in the operating room register.

(2) The hazard of static sparks shall be reduced by electrically connecting the patient, operating room table, anesthesia gas machine, and anesthesiologist by wet sheets or other conductive materials. Conductive accessories shall be used for the electrically conductive pathways from the anesthesia gas machine to the patient.

(g) When the ground contact signal (red light) lights and/or the audible warning sounds, the administration of flammable anesthetic agents shall be discontinued when feasible. Following the completion of the operation the operating room in which the signal functioned shall not be used until a report has been received from the Engineering Department that the electrical defect has been remedied.

(h) Interchange of personnel and portable equipment between flammable and nonflammable anesthetizing locations shall be strictly controlled.

(i) Transportation of patients while an inhalation anesthetic is being administered by means of a mobile anesthesia machine shall be prohibited, unless deemed essential for the benefit of the patient in the combined judgement of the surgeon and anesthetist.

5. Enforcement

It shall be the responsibility of ..... (an anesthesiologist
(name)
or other qualified person appointed by the hospital authority to act in that capacity) to enforce the above regulations.

APPENDIX C.

Standards Referred to in Standard for the Use of Inhalation Anesthetics.

The following standards are referred to in the foregoing Code and contain requirements that must be observed in achieving full compliance with the Code.

Numbered standards preceded by the initials NFPA are available in pocket editions from the National Fire Protection Association. They are also included in the designated volume of the National Fire Codes, also published by the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

NFPA 76A, Essential Electrical Systems for Hospitals.

NFPA No. 90A, Air Conditioning & Ventilating Systems.

NFPA 70, National Electrical Code, 1971.

NFPA 78, Lightning Protection Code.

NFPA 56F, Nonflammable Medical Gas Systems.

NFPA No. 704M, Identification of the Fire Hazards of Materials.

Other Publications:

ANSI Standard, Compressed Gas Cylinder Valve Outlet and Inlet Connections, B57.1 — 1965. Available from Compressed Gas Association, Inc., 500 Fifth Ave., New York, N. Y. 10036.

ANSI Standard, Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1 — 1954. Available from the Compressed Gas Association, 500 Fifth Ave., New York, N. Y. 10036.

Table on Pressure Relationships and Ventilation of Certain Hospital Areas, ASHRAE Guide and Data Book-Applications, published annually. Available from American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 345 East 47th St., New York, N. Y. 10017.

Test for Indentation Hardness of Rubber and Plastics by Means of a Durometer, ASTM D 2240–68. Available from the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103.

Regulations of the United States Department of Transportation outline specifications for transportation of explosives and dangerous articles (Federal Code of Regulations — Title 49 — Parts 171–190). Available from Government Printing Office, Washington, D. C. 20401 or from the Bureau of Explosives, 30 Vesey St., New York, N. Y. 10007. In Canada, the regulations of the Board of Transport Commissioners for Canada apply. Available from BTC, Union Station, Ottawa, Ontario.

AATCC Test Method 76–1959 (ANSI L14.112 — 1961) — Determination of the Electrical Resistivity of Fabrics — included in 1962 Technical Manual. Available from the American Association of Textile Chemists and Colorists, P.O. Box 886, Durham, N. C.

Federal Test Method Standard No. 101B, Method 4046. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

APPENDIX D

TYPICAL MEDICAL GAS CYLINDERS
VOLUME AND WEIGHT OF AVAILABLE CONTENTS

Cylinder style & dimensions	Nom. Vol. in³	Name of Gas	Carbon Dioxide	Cyclo-propane	Ethylene	Helium	Nitrous Oxide	Oxygen	Mixtures of Oxygen: Helium	Mixtures of Oxygen: CO_2
		Pressure @ 70 F	838	75	1200 (****)	1600	745	1900	(*)	(*)
A 2" od x 7"	34	Gallons	50	40	40	15	50	20		
		Liters	189	151	151	57	189	76		
		Cu. Ft.	6.68	5.35	5.35	2.00	6.68	2.67		
		Lbs-ozs	0 - 12¼	0 - 9¼	0 - 6¼	0 - 0.3	0 - 12¼	0 - 3.8		
B 3½" od x 12"	87	Gallons	100	100	100	39	100	52		
		Liters	378	378	378	148	378	196		
		Cu. Ft.	13.37	13.37	13.37	5.21	13.37	6.95		
		Lbs-ozs	1 - 8¼	1 - 7¼	0 - 15¼	0 - 0.9	1 - 8¼	0 - 9.2		
D 4¼" od x 17"	176	Gallons	250	230	200	79	250	105	79	105
		Liters	946	871	757	299	946	396	299	396
		Cu. Ft.	33.42	30.75	26.74	10.56	33.42	14.04	10.56	13.98
		Lbs-ozs	3 - 13¼	3 - 5¼	1 - 15¼	0 - 1.8	3 - 13¼	1 - 2.5	*	*
E 4¼" od x 26"	293	Gallons	420	380	330	131	420	174	131	174
		Liters	1,590	1,438	1,249	496	1,590	659	496	659
		Cu. Ft.	56.15	50.80	44.12	17.51	56.15	23.28	17.51	23.28
		Lbs-ozs	6 - 7	5 - 8¼	3 - 3¼	0 - 2.9	6 - 7	1 - 14.8	*	*
M 7" od x 43"	1337	Gallons	2,000		1,600	598	2,000	795	598	795
		Liters	7,570		6,056	2,263	7,570	3,007	2,263	3,007
		Cu. Ft.	267.38		213.92	79.95	267.40	106.28	79.95	106.23
		Lbs-ozs	30 - 10		15 - 10	0 - 13.2	30 - 10¼	8 - 12.7	*	*
G 9¼" od x 51"	2370	Gallons	3,265		2,800	1,061	3,655	1,408	1,061	1,408
		Liters	12,358		10,598	4,016	13,836	5,331	4,016	5,331
		Cu. Ft.	436.50		374.38	141.86	488.67	188.24	141.86	188.31
		Lbs-ozs	50 - 0		27 - 5¼	1 - 7.5	55 - 15¼	15 - 9.4	*	*
H (**) 9¼" od x 51"	2660	Gallons					4,200	1,831		
		Liters	***				15,899	6,931		
		Cu. Ft.					561.54	244.79(**)		
		Lbs-ozs					64 - 5¼	@2200psig.		

NOTES: (*) The pressure and weight of mixed gases will vary according to the compositon of the mixture.

(**) H cylinders of therapy oxygen are also available which have a nominal volume of 2875 cu. in. and contain 250 cu. ft. of oxygen when filled to a pressure of 2250 psig. @ 70 F.

(***) DOT Regulations prohibit the filling of cylinders, sizes G or H, with Carbon Dioxide in excess of 50 lbs. (3265 gals.). The tabulated weights of the liquified gases, rounded to the nearest ¼ ounce, do not exceed the maximum permissible filling density established by DOT Regulations.

(****) Content based on use of DOT 3A2000 cylinders @ 32.5% filling density. (DOT Reg. 73.304 (a) (2))

APPENDIX E.

Suggested Procedure in the Event of a Fire or Explosion

E11 General.

E11.1 Fires in hospitals pose unique problems for hospital personnel, patients and fire service personnel. Hospitals store and use relatively large quantities of flammable and combustible substances. Oxygen enriched atmospheres are often employed in medical therapy, and are utilized routinely during administration of anesthesia. The presence of flammable and combustible substances and oxygen enriched atmospheres under the same roof with nonambulatory patients presents an extra-hazardous situation. All hospital personnel should understand the steps to take to save life, preserve limb, and contain smoke and/or limit fire until the fire department arrives. It is recommended that the procedures delineated herein, or similar ones, become a part of the fire safety regulations of every hospital.

E12 Steps to Take in the Event of a Fire or Explosion.

E12.1 The following steps, in the approximate order of their importance, should be taken by all personnel, should fire occur. If an explosion occurs, and it is not followed by fire, follow the procedure outlined under E12.2. If a fire follows an explosion, proceed as follows:

1. Remove the immediately exposed patient or patients from the site of the fire, if their hair or clothing are not burning. If they are burning, extinguish the flames (see E14 and E15).

2. Sound the fire alarm by whatever mode the hospital fire plan provides.

NOTE: It is assumed that each hospital has a fire plan, prepared in consultation with representatives of the local fire department. In such a plan, immediate notification of the local fire department is essential.

3. Close off the supply of oxygen to any equipment involved, if this step can be accomplished without injury to personnel (see E13).

4. Close doors to contain smoke and isolate fire.

(a) remove patients threatened by the fire;

(b) attempt to extinguish or contain the fire (see E14);

(c) direct firefighters to the site of the fire;

(d) take whatever steps are necessary to protect or evacuate patients in adjacent areas.

NOTE 1: In the event of a fire in an operating room while an operative procedure on an anesthetized patient is in progress, it may be necessary to extinguish the fire prior to removing the patient from the room.

NOTE 2: During an operation, it may be more hazardous to move patients than to attempt to extinguish or contain the fire. The surgeon must determine which step would present the lesser hazard — hurriedly terminating an operative procedure or continuing the procedure and exposing the members of the operating team and the patient to the hazards stemming from the fire.

E12.2 The following steps are recommended in the event of an explosion involving inhalation anesthesia apparatus:

(a) disconnect the patient from the apparatus;

(b) procure a new gas anesthesia apparatus and make every effort to save the life of the patient and prevent injury to him.

E12.3 It is essential that all equipment involved in a fire or explosion be preserved for examination by an authority attempting to determine the cause. Additionally, pertinent administrative data, including photographs, should be recorded. It should state:

(a) whether wearing apparel of all persons in the room at the time of the fire or explosion met the requirements of Sections 3514 and 3515 of this Code;

(b) whether portable equipment, low voltage instruments, furniture and accessories met the requirements of Articles 2411, 2412, 253, and 254, respectively, of this standard;

(c) whether the ventilating system was being operated in accordance with Article 222 of this standard.

E12.3.1 The area involved, with all involved items in place, should be closed off and secured, for later examination by responsible authority.

E13 Closing off oxygen supply.

E13.1 In the event of a fire involving equipment connected to an oxygen station outlet, the zone valve supplying that station is to be closed (see E16.1 (a)).

E13.1.1 Immediately, all patients receiving oxygen through the same zone valve must be supplied with individual oxygen cylinders.

NOTE: Each gas line to an operating room should have an individual zone valve (see NFPA No. 56F). Thus, closing of all valves to one room would not endanger patients in other rooms.

E13.2 If fire involves apparatus supplied by a cylinder of oxygen, it is desirable to close the cylinder valve, if this can be done without injuring personnel.

NOTE: Metal components of regulators and valves can become exceedingly hot if exposed to flame. Personnel are cautioned not to use their bare hands to effect closure.

E14 Extinguishment or Containment of Fire.

E14.1 Fire originating in or involving inhalation anesthesia apparatus generally involves combustibles such as rubber. Water or water-based extinguishment agents are most effective in such fires.

E14.1.1 Precaution should be observed if line-powered electrical equipment is adjacent to or involved in fire, because of the danger of electrocution of personnel if streams of water contact live circuits.

E14.1.2 Before attempting to fight fire with water or a water-based extinguishing agent, electrical apparatus should be disconnected from the supply outlet, or the supply circuit de-energized at the circuit panel.

E14.1.3 If such de-energization cannot be accomplished, water should not be employed (see E14.2).

E14.2 Fires involving, or adjacent to, electrical equipment with live circuits must be fought with extinguishers suitable for "Class C" fires, in accordance with NFPA No. 10.

E14.3 Fire extinguishers are classified according to the type of fire for which each is suited.

E14.3.1 Fires involving ordinary combustibles such as rubber, plastic, linen, wool, paper and the like are called "Class A" fires. These may be fought with water or water-based extinguishing agents. Hose lines are suitable for this purpose. Portable extinguishers suitable for "Class A" fires are identified with the latter A contained in a (if colored) green triangle.

E14.3.2 "Class B" fires involve flammable liquids and should be fought only with an extinguisher identified by a letter B contained in a (if colored) red square.

E14.3.3 "Class C" fires involve electrical equipment and should be fought only with an extinguisher identified by a letter C contained in a (if colored) blue circle.

E14.3.4 Carbon dioxide and some dry powder extinguishers are labeled for "Class B" and "Class C" fires. Some dry powder units may be used for all three types. (See NFPA No. 10, Appendix B).

E15 Protection of Patients and Personnel.

E15.1 Serious and even fatal burns of the skin or lungs, from inhaling heated gases, are possible. Thus, it is essential that patients be removed from the scene of the fire whenever practical. Where an anesthetized patient is connected to a burning piece of equipment, it may be more practical as the initial step to remove the equipment and/or extinguish the fire than to remove the patient.

E15.2 Noxious gases produced by fire constitute a threat to life from asphyxia, beyond the thermal burn problem.

E15.2.1 Personnel are cautioned not to remain in the fire area after patients are evacuated, unless they are wearing proper emergency apparatus.

E16 Indoctrination of Personnel.

E16.1 It is highly desirable that personnel involved in the care of patients, including nurses, aides, ward secretaries, and physicians, irrespective of whether they are involved in anesthesia practices, be thoroughly indoctrinated in all aspects of fire safety, including:

1. The location of zone valves of nonflammable medical gas systems, and the station outlets controlled by each valve.
2. The location of electrical service boxes, and the areas served thereby.
3. The location and proper use of fire extinguishers. (See Note 1, E14.2.)
4. The recommended methods and routes for evacuating patients. (See Hospital Fire Plan).
5. The steps involved in carrying out the fire plan of the hospital.
6. The location of fire alarm boxes, or knowledge of other methods for summoning the fire department.

E16.2 To ensure that personnel are familiar with the procedures outlined above, regular instructive sessions and fire drills should be held.

APPENDIX F

RELATED HAZARDS AND SAFEGUARDS

F1. General.

F11. The gas anesthesia apparatus and anesthetic ventilators constitute essential items (in most cases) for the administration of inhalation anesthesia. The safe use of these devices is predicated upon their cleanliness and proper function, as well as an understanding of their proper operation, maintenance and repair.

F2. Selection of a gas anesthesia apparatus.

F21. The individual selecting a gas anesthesia apparatus, either for initial purchase or for application in a given case, should be certain that the apparatus is the proper one for the given application or applications, and that it is in good repair. See Appendices F3, Suggested Method for Assuring Proper Delivery of Oxygen and Nitrous Oxide; F4, Disposable Masks, Bags, Tubing and Bellows; and F5, Decontamination and Cleansing of Reusable Items.

F3. Suggested method for assuring proper delivery of oxygen and nitrous oxide.

F31. This method is recommended to prevent delivery of a gas different from that indicated by the flowmeters, and to detect mixing of gases inside the machine that may result in delivery of dangerous gas mixtures to the patient. The following materials are needed:

three feet of anesthesia delivery hose

an accurate oxygen meter, analyser or detector (see 3372); this device may be of the paramagnetic, platinum electrode, gas chromatographic or mass spectrometer type.

F32. Detailed steps of a method of testing anesthesia machines to assure the absence of hazard due to crossed connections between oxygen and nitrous oxide.

F321. Premises:

F3211. It is reasonable to conclude that no hazardous cross connections or cross leakages are present if gas from the only source available is delivered by only those valves intended for that gas, and that no gas is delivered by those valves when their intended source is unavailable, but other sources are available.

F3212. It is not necessary to know the composition of a gas in order to determine the extent of the circuit it supplies.

F3213. The operation of the oxygen circuit is independent, but the operation of some or all of the other circuits may be at least partially dependent on the operability of the oxygen circuit, e.g., fail safe valves.

F322. Method:

F3221. All anesthesia machines have at least one source of oxygen. This may be a large cylinder, one or two small cylinders, or a pipeline supply. Some

machines have two such sources, and a very few have all three. Each should be tested separately. Proceed as follows:

F3222. Disconnect *all* gas sources and open all needle valves and flush valves until all gas has stopped flowing from the machine outlet. Then close all needle valves and flush valves. Be certain that *all* cylinder pressure gauges read zero. Connect an oxygen cylinder to an oxygen hanger yoke and open the cylinder valve. Pressure must rise in the corresponding oxygen pressure gauge only. Close the cylinder valve.

F3223. Repeat Paragraph F3222 exactly for *each* oxygen hanger yoke, including any fed by high pressure lines from large cylinders. Leave the cylinder in the last hanger yoke tested, with the cylinder valve open.

F3224. Open in succession and leave open all the needle valves for gases *other than oxygen*. Briefly open any flush valve for a gas other than oxygen. No flow should occur at the machine outlet. An easy way to test for gas flow is to simply place the machine outlet tube in a glass of water and observe bubbling. Stand clear when flush valves are operated.

F3225. Open and close in succession each of the oxygen needle valves, including any which provide an independent source of oxygen for vaporizers, and the oxygen flush valve. Flow should occur at the associated flowmeter or the machine outlet each time a valve is opened.

F3226. If the machine is equipped for a pipeline oxygen supply, close the oxygen cylinder valve and open the oxygen flush valve. When gas stops flowing at the machine outlet, close the flush valve and all needle valves and connect the *oxygen pipeline inlet* to an *oxygen pipeline outlet* with the *oxygen* supply hose. Then repeat F3224 and F3225.

F3227. Since it is now established that oxygen *is* delivered to the oxygen needle and flush valves, and *is not* delivered to any other needle or flush valve, it remains to determine that it and it alone is also available to perform any other function for which it is essential. A valve which shuts off the supply of any other gas to the appropriate needle valve in the event of oxygen supply pressure failure, commonly called "fail safe" valve, performs such a function. It should be tested as follows:

F3228. Disconnect the pipeline supply and open the oxygen flush valve until flow stops at the machine outlet, then close the flush valve. Install a cylinder of nitrous oxide in one hanger yoke, open the cylinder valve, and note the pressure on *all* cylinder pressure gauges. Only the nitrous oxide gauge should show any pressure.

F3229. Open in succession and leave open all the needle valves for gas *other than nitrous oxide*. Briefly open any flush valve for a gas other than nitrous oxide. No flow should occur at the machine outlet, nor at any flowmeter.

NOTE: An easy way to test for gas flow is to simply place the machine outlet tube in a glass of water and observe bubbling. Stand clear when flush valves are operated.

F3230. Open and close in succession each of the nitrous oxide needle valves and nitrous oxide flush valves. If any delivers flow, all should do so.

F3231. If neither the nitrous oxide needle valves nor the nitrous oxide flush valve deliver flow, open the oxygen cylinder valve and repeat F3229 and F3230. Each nitrous oxide needle valve and flush valve should deliver flow to the machine outlet.

F3232. Close the nitrous oxide cylinder valve and open a nitrous oxide needle valve until all gas stops flowing, then remove the nitrous oxide cylinder and close the needle valve. Repeat F3228, F3229, F3230 and F3231 using any other nitrous oxide yoke.

F3233. If the machine is equipped for a pipeline nitrous oxide supply, close the nitrous oxide cylinder valve and open a nitrous oxide needle valve until all gas stops flowing, then close all needle valves and flush valves. Connect the *nitrous oxide* pipeline inlet with a *nitrous oxide* pipeline outlet with the *nitrous oxide* supply hose. Then repeat F3229, F3230 and F3231.

F4. Disposable masks, bags, tubing and bellows.

F41. It is well recognized that newer technologies often lead to the introduction of new equipment and techniques, which in turn may lead to new hazards, or the potentiation of old ones. For example, the use of disposable and non-distensable conductive accessories potentiate the hazards of excessive airway pressures. These components should be employed only when it is assured that system pressure cannot become excessive.

F411. Many plastic items are combustible. Most of these materials will emit toxic compounds when subjected to thermal decomposition. Special care must be exercised during storage, use and disposal of these items, to preclude accidental ignition. Due consideration must be given to on site storage of trash prior to removal from the operating suite. The presence of these items on the hospital premises contributed significantly to the solid waste disposal problem facing the modern hospital.

F4111. The Committee recommends that purchasing policies of the institution, as well as the practices of individual physicians and nurses, take into consideration the multiple problems posed by plastic items, and limit purchases and use of them to those items deemed essential for the proper function of the institution.

F5. Decontamination and routine cleansing of reusable items.

F51. Under certain circumstances infectious organisms can be cultured from the breathing passages of ventilators, anesthesia valves, absorbers, tubing, bags, masks and connectors. Some of these organisms can remain viable for many days. Although evidence that cross infection from such sources can and does occur is very scanty, it is suggested that the user of such equipment consider implementation of one of the following methods. Mechanical cleansing with soap and water should precede sterilization. Alternative approaches to routine cleansing include:

F511. Mechanical cleansing with soap and water, followed with air drying in a stream of compressed air.

F512. Mechanical cleansing with soap and water, followed by exposure to a preparation such as a dialdehyde solution.

F513. Mechanical cleansing with soap and water, followed by ethylene oxide, steam, or dry heat sterilization.

F52. Following gross contamination, the step outlined in F512 or F513 should be employed.

NOTE 1. Whenever ethylene oxide or dialdehyde is used, care must be taken to assure complete removal of residuals.

NOTE 2. Recommendations for cleansing and sterilization supplied by manufacturer of the item of equipment should be followed.

F521. External contamination of the gas anesthesia apparatus, ventilator and other equipment employed on and around the patient may become contaminated externally as well as internally. Cleansing at least at weekly intervals, as well as immediately after use in an infectious case, is likewise recommended.

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408 Aircraft Egress '71
409 Aircraft Hangars '73
[illegible] Aircraft Cabin
[illegible] Aircraft
[illegible] Fuel
[illegible] Aircraft
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] Terminals '74
417 Loading Walkway '73
418 Fixed Equipment '71
419 Airport Water Systems '69
421 Airport Interior F.P. '73
422M Aircraft Fire Investigators Manual '72
501A Mobile Home Parks '74
501B Mobile Homes '71
501C Recreational Vehicles '74
501D Recreational Vehicles '74
505 Power Industrial Trucks '71
512 Truck Fire Protection '71
513 Motor Freight Terminals '73
601 Guard Service '68
[illegible] Operations '68
[illegible] Barricades
[illegible] Hospitals '68
[illegible] Fire Code '75
701 Welding Apparatus
701 Fire Retardant Fabrics, Methods '71
[illegible]
[illegible]
[illegible] Equipment
[illegible] Lighting '73
[illegible] Fixed Equipment '73
[illegible] Protection
[illegible] Museums '73
1001 Fire Fighter Prof. Qual. '74

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NFPA 56A

STANDARD FOR THE USE OF

INHALATION ANESTHETICS 1973

$2.00

PLAINTIFF'S EXHIBIT
Received 3/20/76
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464. Interconnecting Conductive Accessories.

4641. All accessories which are required to be resilient or flexible on the anesthesia machine, and which form part of an interconnecting electrically conductive pathway, such as tubing, inhalers, rebreathing bags, headstraps, retainers, face masks, handbulbs and similar items shall be of conductive material throughout. Electric resistance of such accessories shall be not greater than one megohm when tested as specified in 4651.

NOTE: When a nonconductive endotracheal catheter is in use, the conductive path from the patient to the anesthesia machine should be maintained by the use of a conductive head strap.

4642. Tubing and connectors used for suctioning shall provide a continuous electrically conductive pathway to the vacuum bottle and to the vacuum outlet. The materials used shall be conductive throughout, or where it is necessary for visual monitoring may be of antistatic material with antistatic properties good for the specified life* of the material provided they embody a continuous integral conductive pathway designed so that in normal use the conductive pathway shall make and maintain conductive contact with conducting materials. Electric resistance of such tubing and connectors shall be not greater than one megohm when tested as specified in 465.

*"Specified life" refers to the permanence of the antistatic property with respect to the stated life of the material, including storage, and is of particular importance if the material is expected to be used and cleaned (e.g., washed) several times.

4643. All belting used in connection with rotating machinery shall have incorporated in it sufficient conductive material to prevent the development of electrostatic charges. A conductive pulley shall be used.

NOTE: The conductivity of the path from the pulley to the ground should be considered. If ball bearings are used, the contact between the balls and the races will probably be sufficient when bearings are lubricated with graphited oil or grease. If sleeve bearings are used, some means of conducting the charge from the pulley should be provided.

4644. Items which are not parts of a machine should be of conductive materials throughout, particularly where the item is depended on to provide a conductive pathway between other conductive items and/or the patient (see note after 4641). For essential elements in surgery, such as prosthetic and therapeutic devices, bacterial barriers, instruments, gloves (thermoplastic: for example, PVC), or bio-mechanical equipment, antistatic materials should be used if conductive materials are not available or impractical. Regular materials may be used in approved devices shown by test to be nonhazardous.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF NEW YORK

BRUNSWICK CORPORATION,)
and)
SHERWOOD MEDICAL INDUSTRIES, INC.,)
Plaintiffs,)
v.) Civil Action No. 68-CV-25
DAVID S. SHERIDAN,)
and)
NATIONAL CATHETER CORPORATION,)
Defendants.)

ANSWER OF DEFENDANTS, DAVID S. SHERIDAN AND NATIONAL CATHETER CORPORATION TO COMPLAINT, AND COUNTERCLAIM OF DEFENDANT, DAVID S. SHERIDAN, AGAINST PLAINTIFF, BRUNSWICK CORPORATION, AND PLAINTIFF, SHERWOOD MEDICAL INDUSTRIES, INC.

First Defense

Neither the complaint, nor any count thereof, states a claim upon which relief can be granted to plaintiffs against either defendant.

Second Defense

The basic dispute between the parties is whether or not Brunswick Corporation has breached its contract with David S. Sheridan. Secondarily there is involved the question whether such breach, if established, amounts to a constructive termination of the contract by Brunswick Corporation. Brunswick Corporation, as plaintiff, is not entitled to use declaratory judgment procedures to establish its defense.

Third Defense

1. Defendants admit the allegations of numbered paragraphs 1, 2, 3 and 4, in Count I of the Complaint.

2. Defendants deny the allegations contained in numbered paragraph 5, of Count I, and aver instead that on or about February 18, 1960 a master contract was entered into between David S. Sheridan,

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Sheridan Catheter and Instrument Corporation and the then Brunswick-Balke-Collender Corporation. Said master contract included the employment agreement attached to the complaint as Exhibit B. Defendants deny the characterizations contained in the remainder of numbered paragraph 5, but admit that on or about November 22, 1966, Sheridan Catheter and Instrument Corporation was merged with Brunswick Corporation.

3. Defendants admit the allegations of numbered paragraph 6, of Count I, except that they deny the statement with respect to the authority and jurisdiction of the Aloe Division over operations of the facility at Argyle.

4. Defendants deny the allegations of numbered paragraph 7, of Count I, and state instead that the successful growth and profit was attributable to the contributions of David S. Sheridan.

5. Defendants admit the first sentence of numbered paragraph 8, of Count I, but deny all of the remainder and, particularly, that David S. Sheridan voluntarily gave up any of the prerogatives to which he was entitled under his contract.

6. The allegations contained in numbered paragraph 9, of Count I, are irrelevant in that the fact that Brunswick Corporation may have paid David S. Sheridan did not give it any right to strip him of the authority to which he was entitled by contract.

7. Defendants admit the allegations of numbered paragraph 10, of Count I.

8. Defendants state that the allegations contained in numbered paragraph 11, of Count I, are self-serving declarations and deny that Brunswick Corporation ever made any bona fide effort to restore David S. Sheridan to the position to which he was entitled by contract.

9. Defendants admit that David S. Sheridan never appeared for work at the North Argyle facility subsequent to October 9, 1967. They deny the remainder of the allegations in numbered paragraph 12, of Count I, except that defendant, David S. Sheridan, admits that he has asserted that Brunswick Corporation, by its breach, wrongfully

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terminated his contract.

10. Defendants deny the allegations in numbered paragraph 13, of Count I, and further deny that plaintiffs are entitled to any of the relief requested in said count.

11. In response to Count II, defendants raise the same defenses pleaded in response to Count I and, in addition, state that they are without knowledge or information which is sufficient to form a belief with respect to the truth of the allegations contained in numbered paragraph 3, of Count II, and, therefore, deny the same and demand strict proof thereof. Further, in response to numbered paragraph 3, of Count II, defendants state that any transfer of assets to Sherwood Medical Industries, Inc., was required by contract to be made in preservation and recognition of the rights of David S. Sheridan.

12. Defendants deny the allegations in numbered paragraph 4, of Count II.

13. Defendants deny the allegations in numbered paragraph 7, of Count II, and state that since the contract speaks for itself, any contentions based thereon must be governed by reference to the terms of the instrument. Defendants further state that David S. Sheridan lived up to the obligations of his contract until it was wrongfully terminated by plaintiff, Brunswick Corporation, after which he was no longer bound by any of its terms.

14. Since the contract speaks for itself, any contentions based thereon must be governed by reference to the terms of the instrument. Defendants deny the allegations contained in numbered paragraph 8, of Count II.

15. Defendants state that Brunswick Corporation had no trade secrets as are alleged in numbered paragraph 9, of Count II. Its expertise was gained from David S. Sheridan by virtue of the contracts which it entered into with him. Brunswick Corporation's position in the industry was acquired by its exploitation of David S. Sheridan. Defendants, therefore, deny the allegations of numbered paragraph 9, in Count II.

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16. Defendants deny the allegations contained in numbered paragraph 10, of Count II, and state that David S. Sheridan has made no long-range plans to date. He has been impeded in his progress towards obtaining gainful employment by the misrepresentations of Brunswick Corporation to the effect that he is still subject to its control and direction as an employee and by reason of the terminated contracts. The remainder of numbered paragraph 10 is conjecture and warrants no response.

17. Defendants deny the allegations contained in numbered paragraph 11 of Count II and further deny that plaintiffs are entitled to any of the various forms of relief requested in said Count.

18. In response to Count III, defendants reassert all of the defenses and contentions made with reference to the claims and allegations made in Counts I and II.

19. Defendants deny the allegations in numbered paragraph 9, of Count III, and state that any employees which they have, came to them in the exercise of their own free will and not in violation of any contractual rights of plaintiffs.

20. Defendants, although legally free to compete, deny the allegations as made in numbered paragraphs 10 and 11, of Count III. Defendants should not be required to answer such speculative allegations.

21. Defendants deny that plaintiffs are entitled to any of the relief requested in Count III.

22. In response to Count IV, defendants reassert all of the defenses and contentions made with reference to the claims and allegations made in Counts I, II and III. They further state that the license agreement was a part of the master contract executed on or about February 18, 1960 and contend that any claims based thereon be made with reference to the specific terms of the document which speaks for itself.

23. Defendants deny the allegations contained in numbered paragraph 7, of Count IV, stating, instead, that Brunswick Corporation's investment was made pursuant to the entire master contract

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entered into on or about February 18, 1960. Plaintiffs should not be entitled to take advantage of some parts of the contract, while disavowing other portions of it which they conclude are not as much to their advantage. Sherwood Medical Industries, Inc., accepted transfer of facilities and exchanged its stock with full knowledge of relevant circumstances and, therefore, obtained no greater rights than Brunswick Corporation had. The recitation of past royalty payments is not relevant and is made in an apparent attempt to convince the Court that David S. Sheridan has already obtained the consideration for which he bargained. However, the payment of royalties does not entitle Brunswick Corporation to breach other portions of the contract with impunity.

24. Defendant, David S. Sheridan, contends that when Brunswick Corporation breached his contract, a constructive termination occurred, so that no part of it remained in force and effect. This contention is based upon the premise that Brunswick Corporation is not entitled to avail itself of what it considers to be the favorable portions of the contract at the same time that it repudiates the remainder and this contention fully answers numbered paragraph 8, in Count IV.

25. Defendants deny the allegations contained in numbered paragraph 9, of Count IV.

26. Defendants deny that plaintiffs are entitled to any of the relief requested in Count IV and specifically state that there is no basis for the implied contention that David S. Sheridan has made any threats or has attempted to hinder or interfere with either plaintiff in the legitimate or lawful pursuits in which they may be engaged.

27. Defendants further deny each and every other material allegation contained in the complaint, or any count thereof, which is not herein specifically answered.

Fourth Defense

Plaintiffs' claims are barred by a failure of consideration with respect to the contracts from which plaintiffs' alleged rights

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are derived, in that those contracts entitled defendant, David S. Sheridan, to be and remain head of the catheter operation at the plant in Argyle, New York.

Fifth Defense

Plaintiffs' demands for equitable relief are barred by reason of the fact that plaintiffs do not have clean hands and equitable relief is not available to plaintiffs who have not acted equitably themselves.

Sixth Defense

Plaintiffs' claims are barred by the appropriate public policy considerations applicable in the State of New York.

Seventh Defense

The noncompete agreement which plaintiffs by this action attempt to enforce is unenforceable and unreasonable in that it is unlimited in time, area and circumstance and too broad to be given legal effect.

Eighth Defense

Plaintiffs are estopped from asserting any claims based on the contracts from which plaintiffs' alleged rights are derived, since plaintiffs themselves have destroyed the consideration on which such contracts were based.

COUNTERCLAIM

Comes now defendant, David S. Sheridan, and in support of his counterclaim against plaintiffs, Brunswick Corporation, and Sherwood Medical Industries, Inc., formerly known as Argyle Medical Industries, Inc., states as follows:

Count I

1. Prior to February 18, 1960 counterclaimant was the major stockholder in Sheridan Catheter and Instrument Corporation, whose productive facilities were located in Argyle, New York. Counterclaimant was also its founder and president and his inventive skill and technology were major assets of that corporation.

2. During the latter part of 1959 Brunswick Corporation, then Brunswick-Balke-Collender Corporation, entered into negotiations to

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purchase Sheridan Catheter and Instrument Corporation. Integral parts of the proposal made by Brunswick Corporation were the acquisition of the exclusive license to make, use and sell catheter products covered by certain designated patents and processes owned by David S. Sheridan and the acquisition of David S. Sheridan's professional services on a full time, long term, employment contract basis.

3. David S. Sheridan and Sheridan Catheter and Instrument Corporation accepted one of various proposals made by Brunswick Corporation and on or about February 18, 1960 a master contract was executed. A copy of that contract, and its exhibits A, B, C, D and E, are attached hereto as Exhibit 1.

4. The execution of exhibit D and exhibit E to the master contract were conditions precedent to the execution of the master contract and formed essential and necessary parts of the consideration therefor.

5. David S. Sheridan from the inception of Brunswick Corporation's operation occupied the office of president and was the head of the operations at Argyle, New York. He continued to serve in this capacity even after the merger of Sheridan Catheter and Instrument Corporation with Brunswick Corporation, which merger was accomplished upon the express condition that it should have no adverse effect upon the contractual rights of David S. Sheridan.

6. Although such activities were first unnoticed, Brunswick Corporation embarked upon a course of conduct designed to relegate David S. Sheridan to an inferior position at the Argyle plant, and, thereby attempted to deprive him of the rights and prerogatives guaranteed by his contract. This course of conduct culminated when, by letter dated September 19, 1967, J. N. Willman, head of Brunswick Corporation's Health and Science Divisions, advised David S. Sheridan that he had no duties at the Argyle plant, other than to spearhead product development. In that same communication, J. N. Willman advised David S. Sheridan that he would repudiate, before the employees at Argyle and elsewhere, any effort on the part of David S. Sheridan to re-establish his position on the organizational charts.

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7. The course of conduct complained of constituted an unlawful termination of the contractual relationship between David S. Sheridan and Brunswick Corporation.

8. By the terms of the employment agreement, Brunswick Corporation could legally terminate the relationship after five years, beginning from February 26, 1960, only by giving written notice of its election to terminate six months prior to the next anniversary date of the contract. In September 1967 the earliest date on which Brunswick Corporation could have legally terminated the employment contract of David S. Sheridan was February 26, 1969.

9. By its breach and constructive termination of the contract, Brunswick Corporation has deprived counterclaimant, David S. Sheridan, of compensation to which he was entitled, all to his great damage in the sum of Thirty-four Thousand One Hundred Seventy-nine and 75/100 Dollars ($34,179.75).

WHEREFORE, counterclaimant, David S. Sheridan, demands judgment against plaintiff, Brunswick Corporation, for salary through what would have been the remainder of his employment contract in the sum of Thirty-four Thousand One Hundred Seventy-nine and75/100 Dollars ($34,179.75), plus interest at the rate of six per cent per annum, the costs of this action and such other further and proper relief as may be warranted.

Count II

1. Defendant, David S. Sheridan, herein realleges the allegations contained in numbered paragraphs 1, 2, 3, 4, 5, 6, 7 and 8 of Count I of this counterclaim.

2. By breaching the contract, Brunswick Corporation constructively terminated the contractual relationship which had previously existed between Brunswick Corporation and David S. Sheridan so that it no longer had any legal right to use the patents and processes previously licensed and assigned to it by David S. Sheridan. In addition to the breach alleged, counterclaimant, David S. Sheridan, contends that there has been a partial failure of the consideration which induced him to enter into the license agreement.

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3. Plaintiffs, Brunswick Corporation and Sherwood Medical Industries, Inc., despite appropriate demands to cease and desist, continue to proceed upon the basis of the terminated license agreement and thereby infringe upon the patents or processes owned by counterclaimant, David S. Sheridan. In doing so, plaintiffs avail themselves of the portions of the contract which they consider beneficial, having rejected the portions they chose to disregard, all to counterclaimant's great damage in the amount of One Hundred Thousand Dollars ($100,000.00), which damage continues to increase with every day that Brunswick Corporation and Sherwood Medical Industries, Inc., proceed upon the basis of the terminated license agreement and infringe upon the patents or processes owned by counterclaimant, David S. Sheridan.

WHEREFORE, counterclaimant, David S. Sheridan, demands judgment against plaintiffs, Brunswick Corporation and Sherwood Medical Industries, Inc., jointly and severally, in the sum of One Hundred Thousand Dollars ($100,000.00), from September 19, 1967 to date and continuing at the rate of Fifty Thousand Dollars ($50,000.00) per quarter thereafter until this cause is finally determined, together with interest at the rate of six per cent per annum, the costs of this action and such further and proper relief as may be warranted.

In addition, counterclaimant prays that pending a final disposition of this cause, plaintiffs be temporarily restrained and preliminarily enjoined from infringing upon the patents or processes which he owns, which were licensed under the terms of the master contract dated February 18, 1960 or otherwise thereafter made available to plaintiffs as a result of such master contract, and which reverted to counterclaimant upon the termination of the contract by Brunswick Corporation on September 19, 1967. Further, counterclaimant prays that plaintiffs be permanently enjoined from infringing on the patents and processes aforesaid and from further production, sale or distribution of any and all products embodying any such patents or processes.

Count III

1. Counterclaimant, David S. Sheridan, herein realleges the

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allegations contained in numbered paragraphs 1,2, 3, 4, 5, 6, 7 and 8, of Count I of the counterclaim.

2. Despite its breach and constructive termination of the contract on September 19, 1967, Brunswick Corporation has continued to interfere with counterclaimant's right and opportunity to establish a new business relationship for himself to replace that which was taken away from him as a result of Brunswick Corporation's breach of contract. For a considerable period of time and when it served Brunswick Corporation's purposes, misrepresentations were made both to its employees and to the public that David S. Sheridan was still employed by and working for Brunswick Corporation. In addition, misrepresentations were made that hindered counterclaimant and interfered with his opportunity to become productively engaged in the production and manufacture of products in the catheter line because of the impression created that he was unable to do so because of continuing controls exercised by the Brunswick Corporation.

3. In making such misrepresentations Brunswick Corporation has misled the public into believing that David S. Sheridan is still in its employ and subject to its controls and has attempted to secure for itself the advantage accruing to David S. Sheridan's name, reputation and good will in catheter and medical tubing products lines, all to his great damage in the sum of One Hundred Thousand Dollars ($100,000.00).

WHEREFORE, counterclaimant, David S. Sheridan, demands judgment against plaintiff, Brunswick Corporation, in the sum of One Hundred Thousand Dollars ($100,000.00), together with interest at the rate of six per cent per annum, the costs of this action and such further and proper relief as may be warranted.

In addition, counterclaimant prays that pending a final determination of this cause, plaintiff be temporarily restrained, preliminarily enjoined and permanently enjoined from making any misrepresentations with reference to (1) any continuing employment relationship between counterclaimant and Brunswick Corporation or Sherwood Medical Industries, Inc.; (2) any continuing contractual obligations

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to either plaintiff; or (3) from making any statement which would impair or otherwise interfere with counterclaimant's attempt to re-establish his productive capacity, either in his own name or by the establishment of a business relationship with other persons, firms or organizations.

Count IV

1. From October 1, 1966 through June 1967, Brunswick Corporation used a portion of real property owned by counterclaimant, David S. Sheridan, and located immediately adjacent to Brunswick Corporation's plant at North Argyle, New York, as a parking lot for approximately fifty automobiles belonging to its personnel. From July 1, 1967 through October 1967, the number of automobiles belonging to Brunswick Corporation employees and parked on counterclaimant's land increased to one hundred and then to one hundred and fifty.

2. During this period of Brunswick's use, negotiations for appropriate compensation were in progress and counterclaimant never acquiesced to the gratuitous use of his property. Despite its commencement of these negotiations, Brunswick Corporation never completed the negotiations and has permitted its employees and agents continued use of the land, with full knowledge that said use was to be conditioned on the payment of just and adequate compensation to counterclaimant, David S. Sheridan.

3. Despite the obligations aforesaid, and despite numerous demands for payment, Brunswick Corporation has failed and refused to make payment, all to counterclaimant's great damage in the sum of Ten Thousand Dollars ($10,000.00).

WHEREFORE, counterclaimant demands judgment against plaintiff, Brunswick Corporation, in the sum of Ten Thousand Dollars ($10,000.00), together with interest at the rate of six per cent per annum, the costs of this action and such further and proper relief as may be warranted.

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HOGAN & HARTSON

By _____
John P. Arness

By _____
Francis T. Coleman, Jr.

815 Connecticut Avenue, N.W.
Washington, D. C. 20006
298-5500

DEGRAFFE, FOY, CONWAY & HOLT-HARRIS

By _____
William F. Conway

90 State Street
Albany, New York
Attorneys for Defendants and
Counterclaimant.

Defendants and counterclaimant demand a trial by jury on all issues presented in the complaint and counterclaim.

HOGAN & HARTSON

By _____
John P. Arness
Attorneys for Defendants and
Counterclaimant.

Certificate of Service

A copy of the foregoing answer and counterclaim was mailed, postage prepaid, this day of May, 1968, to Ainsworth, Sullivan, Tracy & Knauf, Esqs., 75 State Street, Albany, New York 12207, and to Mayer, Friedlich, Spiess, Tierney, Brown & Platt, Esqs., 231 South LaSalle Street, Chicago, Illinois 60604, attorneys for plaintiffs.

DEGRAFFE, FOY, CONWAY & HOLT-HARRIS

By _____
William F. Conway
Attorneys for Defendants and
Counterclaimant.

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Exhibit 34

IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF NEW YORK

BRUNSWICK CORPORATION, and
CHESWOOD MEDICAL INDUSTRIES INC.,

Plaintiffs,

-against-

DAVID S. SHERIDAN and
NATIONAL CATHETER CORPORATION,

Defendants.

C O M P L A I N T

COUNT I

NOW COMES Brunswick Corporation, by its attorneys, and complains against defendant David S. Sheridan as follows:

1. Brunswick Corporation, formerly the Brunswick-Balke-Collender Corporation, (hereinafter referred to as "Brunswick") is a corporation organized and existing under the laws of the State of Delaware and has its principal place of business at 69 West Washington Street, Chicago, Illinois.

2. Defendant David S. Sheridan (hereinafter referred to as "Sheridan") is a citizen of New York, residing on Hook Road, North Argyle, New York. Sheridan formerly was employed by Brunswick at its plant in North Argyle, New York.

3. As used in this complaint, catheter products include various drainage tubes, catheter devices and related products similar to those described in Exhibit A, which is attached hereto and made a part hereof.

4. This count is an action for declaratory judgment pursuant to the Federal Declaratory Judgment Act, 28 U.S.C. Sections 2201 and 2202, for the purpose of determining a question of actual controversy between the parties, as hereinafter more fully appears. The amount in controversy is in excess of $10,000 exclusive of interest and costs.

5. In connection with the transfer of a catheter manufacturing business by Sheridan and his wife to Brunswick, Sheridan on February 26, 1960 entered into an employment agreement with Brunswick and Sheridan Catheter Corporation. A copy of this employment agreement is attached hereto as Exhibit B and made a part hereof. The Sheridan Catheter and Instrument Corporation had become a wholly owned subsidiary of Brunswick and on February 26, 1960 had been and continued to be engaged in the business of manufacturing catheter products in a barn at North Argyle, New York with ten employees, and sales of less than $100,000 per year. On or about November 22, 1966 the subsidiary, Sheridan Catheter and Instrument Corporation, was merged into Brunswick, its parent.

6. Under the terms of the employment agreement Sheridan was employed as head of Sheridan Catheter and Instrument Corporation, initially subject to the authority and jurisdiction of the Aloe Division of Brunswick. At that time, the Aloe Division was primarily engaged in the business of selling and distributing hospital supplies to physicians and hospitals throughout the United States.

7. During the entire period from February 26, 1960 to the present time, the hospital supply sales organization of Brunswick successfully increased sales of catheter devices manufactured at North Argyle, and they became well known and were favorably accepted by physicians and hospitals throughout the United States. Brunswick expended $614,868 for new plant facilities at North Argyle, New York, and installed modern equipment at a cost of $685,599 in order to increase production to meet the increased sales.

8. From the date of said agreement to November 22, 1966 Sheridan held the position as head of Sheridan Catheter and Instrument Corporation into Brunswick, he continued as the head of the facilities at Argyle, New York, under the direction of the Health

and Science Division of Brunswick. By mutual consent, as demonstrated through a course of conduct extending over several years, Sheridan devoted almost his entire time to research and development in a search for new products, improvements on existing products, improved production methods and similar projects, leaving others to perform management functions at the North Argyle facilities. Sheridan was in charge of all research and development at North Argyle and the laboratory facilities there were under his supervision and control and the research technicians reported directly to him.

9. Under the employment agreement, Sheridan received an annual salary of $22,500 until May 31, 1965, at which time his salary was increased to $24,750 per year. Brunswick made all of the payments required under the employment contract and performed all of its obligations under the agreement. In addition, defendant received a stock option, and on January 4, 1960 elected to exercise such option to the extent of purchasing 1250 shares of Brunswick stock at a price of $10,312.50 which had a market value at the time of the exercise of the option of $19,608.75.

10. The employment agreement was for an initial period of five years, that is to February 26, 1965, but it could be continued on a year-to-year basis to 1974 unless sooner terminated under its terms. On October 9, 1967, Sheridan posted a notice on bulletin boards throughout Brunswick's North Argyle plant announcing that he was no longer associated with Brunswick. A copy of such notice is attached hereto as Exhibit C and made a part hereof. Also, on October 9, 1967, Sheridan wrote a letter to Brunswick in which he stated that Brunswick had wrongfully terminated his employment agreement. A copy of this letter is attached hereto as Exhibit D and made a part hereof.

11. In a letter of October 13, 1967 to Sheridan, Brunswick advised him that it had fully performed its obligations

and that Brunswick continued to be ready to perform in the future under the agreement, that it considered defendant's letter of October 9 as a letter of resignation and Brunswick agreed that it would waive the six months notice of termination requirement under the agreement. Brunswick also suggested that if Sheridan wanted to reconsider his resignation, he should promptly advise Brunswick. A copy of the letter of October 10, 1967 is attached hereto as Exhibit E and made a part hereof.

12. After October 9, 1967, Sheridan never again appears for work at the North Argyle plant and has completely failed to perform any services required of him under the contract, although he is accepting payroll checks from Brunswick. Brunswick continued to make these payments subsequent to October 9, 1967 in the event that Sheridan, in the then immediate future, would have reconsidered his resignation. However, now Sheridan has claimed and asserted that Brunswick breached and wrongfully terminated the employment agreement and that Brunswick is indebted to him in the amount of $30,550 which represents salary payments to and including February 26, 1969, even though Sheridan is spending no time in the employ of Brunswick but, on information and belief, is devoting his full energies in an attempt to establish a competing business with Brunswick.

13. The claims and assertions of Sheridan are without basis and an actual controversy exists between the parties.

WHEREFORE, plaintiff Brunswick prays:

A. That this Court declare the rights and legal obligations of plaintiff, Brunswick, and defendant Sheridan under the Employment Agreement here in controversy and under the premises.

B. That this Court declare that Brunswick Corporation has performed its obligations under the Employment Agreement with defendant Sheridan, that defendant Sheridan in fact terminated said agreement on October 9, 1967, and that he continues to be bound by the post-termination provisions of the Employment Agreement.

C. That Brunswick have such other and additional relief as may be proper in the premises, together with the costs of this action.

COUNT II

NOW COMES Brunswick Corporation and Sherwood Medical Industries Inc., by their attorneys, and complain against defendants David S. Sheridan and National Catheter Corporation as follows:

1-2. Plaintiffs reallege the allegations of paragraphs 1 and 2 of Count I of the complaint.

3. Sherwood Medical Industries, Inc., formerly Argyle Medical Industries Inc. (hereinafter referred to as "Sherwood") i a subsidiary of Brunswick and a Delaware corporation with its principal place of business at 69 West Washington Street, Chicago Illinois. As of December 31, 1967, Brunswick was obligated to an did transfer to Sherwood, in exchange for its stock, among other things, the North Argyle plant along with certain of the tangible and intangible assets relating to the business conducted there. This transfer of assets included all right, title and interest to any trade secrets, confidential information and technical know-ho relative to the North Argyle plant. Brunswick will continue to make sales of catheter products manufactured by Sherwood to hospitals and physicians through its hospital supply sales organization. Sherwood will continue the manufacture of catheter product at the North Argyle plant, which will be sold to hospital supply distributors, including the hospital supply sales organization of Brunswick.

4. National Catheter Corporation, Hereinafter referred to as "National"), is a corporation organized and existing since November 9, 1967 under the laws of the State of New York, which has its principal place of business on Hook Road, North Argyle, New York, and on information and belief defendant Sheridan is a principal shareholder and president of National.

-4-

5. Plaintiffs reallege the allegations of paragraph 3 of Count I of the complaint.

6. Plaintiffs reallege the allegations of paragraph 5 of Count I of the complaint.

7. Under the terms of the employment agreement, Sheridan was obligated to fully and promptly disclose to Sheridan Catheter and Instrument Corporation or Brunswick all inventions and improvements made or conceived by him during the course of his employment whether made or conceived solely or jointly with other employees. From February 26, 1960, the date of the employment agreement, to October 9, 1967, the date on which Sheridan wrongfully terminated the agreement, Sheridan through his constant engagement in research made disclosures of potential inventions and improvements to Catheter and Brunswick, some of which resulted in patents and others which remain trade secrets.

8. The employment agreement also provided that Sheridan could not, at any time, without written approval from Brunswick, publish or disclose or authorize anyone else to publish or disclose any technical know-how, date or other information relating to inventions, improvements, secret processes and formulas, whether developed by him or others, or any other confidential information concerning Brunswick's business.

9. Sheridan, in the course of his employment, was fully aware of all of Brunswick's trade secrets with respect to catheter products, from the standpoint of research, development, design and manufacture, among other things. This information is not available to the public generally and Brunswick has enjoyed a position of importance in the production and sale of catheter products as a result of these trade secrets, and Sherwood, the subsidiary of Brunswick, will continue to benefit from these factors in its production and sale of catheter products.

10. On information and belief, Sheridan, after terminating his employment with Brunswick on October 9, 1967, has engaged or is about to engage with National in the manufacture of catheter

products in direct competition with the products manufactured at the North Argyle plant. Under the circumstances, defendants inevitably will utilize and Sheridan will disclose, to the great and irreparable injury of Brunswick and Sherwood, technical know-how, data and other trade secret information which Sheridan acquired during the course of his employment under the agreement of February 26, 1960 in violation of Sheridan's relationship of trust and confidence.

11. Defendants, through the use of these trade secrets, will be able to compete with Brunswick and Sherwood at a much earlier date and at much less expense than would have been feasible by fair means alone. Defendants will take away from Brunswick and Sherwood the competitive advantages which they otherwise would have enjoyed.

WHEREFORE, Brunswick Corporation and Sherwood Medical Industries Inc. pray:

A. That Sheridan and National be ordered to fully and promptly disclose to Brunswick Corporation, and its attorneys, all inventions and improvements made or conceived by Sheridan during the course of his employment under the contract of February 26, 1960, and that Sheridan be ordered to cooperate with Brunswick to prosecute and obtain the issuance of patents for any such invention or improvement and to execute all papers in connection with the prosecution of such patent applications and to assign any and all interests therein to Brunswick Corporation or its assigns.

B. That Sheridan and National be ordered to promptly deliver to Brunswick any and all documents, drawings, models or other tangible items in their possession, custody or control, which contain, disclose, relate or refer to any invention, improvement or patent coming within the scope of the agreement of February 26, 1960.

C. That Sheridan and National be ordered to promptly deliver to Sherwood any and all documents, models, drawings and

other tangible items in their possession, custody or control which contain, disclose, relate or refer to any trade secrets obtained by Sheridan during the course of his employment under the agreement of February 25, 1960.

D. That Sheridan and National be temporarily and permanently enjoined from using, publishing or disclosing to anyone other than Brunswick or Sherwood any technical know-how or other trade secret information relating to the aforesaid business, inventions, improvements, secret processes and formulas.

E. That Brunswick and Sherwood be granted such other and additional relief as may be proper in the premises, together with the costs of this action.

COUNT III

NOW COMES Brunswick Corporation and Sherwood Medical Industries Inc., by their attorneys, and complain against defendants David S. Sheridan and National Catheter Corporation as follows:

1-2. Plaintiffs reallege the allegations of paragraphs 1 and 2 of Count I of the complaint.

3-4. Plaintiffs reallege the allegations of paragraphs 3 and 4 of Count II of the complaint.

5. Plaintiffs reallege the allegations of paragraph 3 of Count I of the complaint.

6-7. Plaintiffs reallege the allegations of paragraphs 7 and 8 of Count I of the complaint.

8. Plaintiffs reallege the allegations of paragraph 9 of Count II of the complaint.

9. Since his departure from the employ of Brunswick, Sheridan has induced two of Brunswick's other research employees to leave Brunswick to work for Sheridan personally or for the National Catheter Corporation. These employees were Sheridan's subordinates in the Brunswick catheter p[illegible] the research group and

also had knowledge of Brunswick's trade secrets relating to catheter products. On information and belief, Sheridan and National Catheter are using the information and knowledge gained from Brunswick by both Sheridan and the purloined Brunswick employees to manufacture products similar to those formerly manufactured by Brunswick and now by Sherwood with the expectation of selling these items in direct competition with Brunswick and Sherwood.

10. On information and belief and under the circumstances, defendants inevitably will utilize, to the great and irreparable injury of Brunswick and Sherwood, technical know-how, data and other trade secret information properly belonging to them, which was acquired by Sheridan and the former Brunswick employees in violation of their relationship of trust and confidence. The damages resulting from defendants' acts of unfair competition amount to more than $50,000.

11. Plaintiffs reallege the allegation of paragraph 11 of Count II of the complaint.

WHEREFORE, Brunswick Corporation and Sherwood Medical Industries Inc. pray:

A. That pending the final disposition of this cause, defendants be temporarily enjoined from using any trade secrets or confidential information obtained by Sheridan in the course of his employment at Brunswick.

B. That pending the final disposition of this cause, defendants be temporarily enjoined from disturbing or interfering in any manner which plaintiffs' catheter products business and particularly from enticing away any other employees or soliciting business from any of plaintiffs' customers.

C. That upon final disposition of this cause such injunction be made permanent.

D. That plaintiffs have judgment against defendants, jointly and severally, in an amount of at least $50,000 for their damages.

E. That they have such other and additional relief as may be proper in the premises, together with the costs of this action.

COUNT IV

NOW COMES Brunswick Corporation and Sherwood Medical Industries Inc., by their attorneys, and complain against David S. Sheridan as follows:

1-4. Plaintiffs reallege paragraphs 1 through 4 of Count I of the complaint.

5. Plaintiffs reallege paragraph 3 of Count II of the complaint.

6. Under an agreement dated March 10, 1960, Sheridan granted to Brunswick and any of its subsidiaries, divisions, agents, sub-contractors or the like, an exclusive license to make, use and sell catheter products covered by designated patents issued to Sheridan and to utilize processes and apparatus under such patents in the manufacture of the products. The agreement was subsequently amended by letter agreement dated September 24, 1963 and amendment dated May 10, 1966. Said license and amendments (hereinafter referred to as the "License Agreement") are attached as Exhibit F to this complaint.

7. Relying on the License Agreement, Brunswick invested well in excess of $1,000,000 in order to fully utilize said patents. It purchased real estate, erected new plant facilities, purchased machinery, hired and trained large numbers of employees, and expensive promotional efforts were undertaken to sell and distribute the products covered by the License Agreement. These facilities were those transferred to Sherwood and Sherwood, in exchanging its stock for these assets, relied on its rights as a subsidiary of Brunswick under the License Agreement to continue to manufacture the catheter products. Brunswick has paid and will continue to pay to defendant all of the royalties, including

royalties on products manufactured by Sherwood, under the License Agreement. Such royalty payments by Brunswick to Sheridan were as follows:

1960	12,307.69
1961	20,000.00
1962	25,439.20
1963	30,939.87
1964	46,[illegible]
1965	63,665.95
1966	91,758.00
1967	117,800.00

8. Since terminating his employment on October 9, 1967, Sheridan has claimed, and continues to claim, for reasons not disclosed, that said License Agreement is no longer in effect. Sheridan has demanded that Brunswick refrain from the production, manufacture, distribution or sale of any and all products involving or in any way relating to the patents or processes licensed under the License Agreement.

9. Sheridan's claim that the License Agreement is no longer in effect and his demands that Brunswick and its subsidiaries cease manufacturing, distributing and selling any of the products are without basis and an actual controversy exists between the parties.

WHEREFORE, Brunswick Corporation and Sherwood Medical Industries Inc. pray:

A. That this Court declare the rights and legal relations of the parties to the subject matter here in controversy particularly with respect to the License Agreement.

B. That this Court declare that the License Agreement is valid and subsisting and that pending final disposition of this cause Sheridan be temporarily enjoined from making any threats, or otherwise attempting to hinder or interfere with Brunswick, Sherwood or any of their customers on the basis of any alleged infringement of the patents licensed under the License Agreement.

C. That upon final disposition of this cause such injunction be made permanent.

D. That Brunswick and Sherwood have such other and additional relief as may be proper in the premises, together with costs of this action.

BRUNSWICK CORPORATION

By _____
Its Attorneys

AINSWORTH, SULLIVAN, TRACY & KNOUF

By _____
A Member of the Firm

Attorneys for the Plaintiffs
Office & P. O. Address
75 State Street
Albany, New York 12207

and

MAYER, FRIEDLICH, SPIEGA,
TIERNEY, BROWN & PLATT
Attorneys for the Plaintiffs
Office & P. O. Address
231 South LaSalle Street
Chicago, Illinois 60604

PLAINTIFF'S EXHIBIT
No. 1/8/76
35

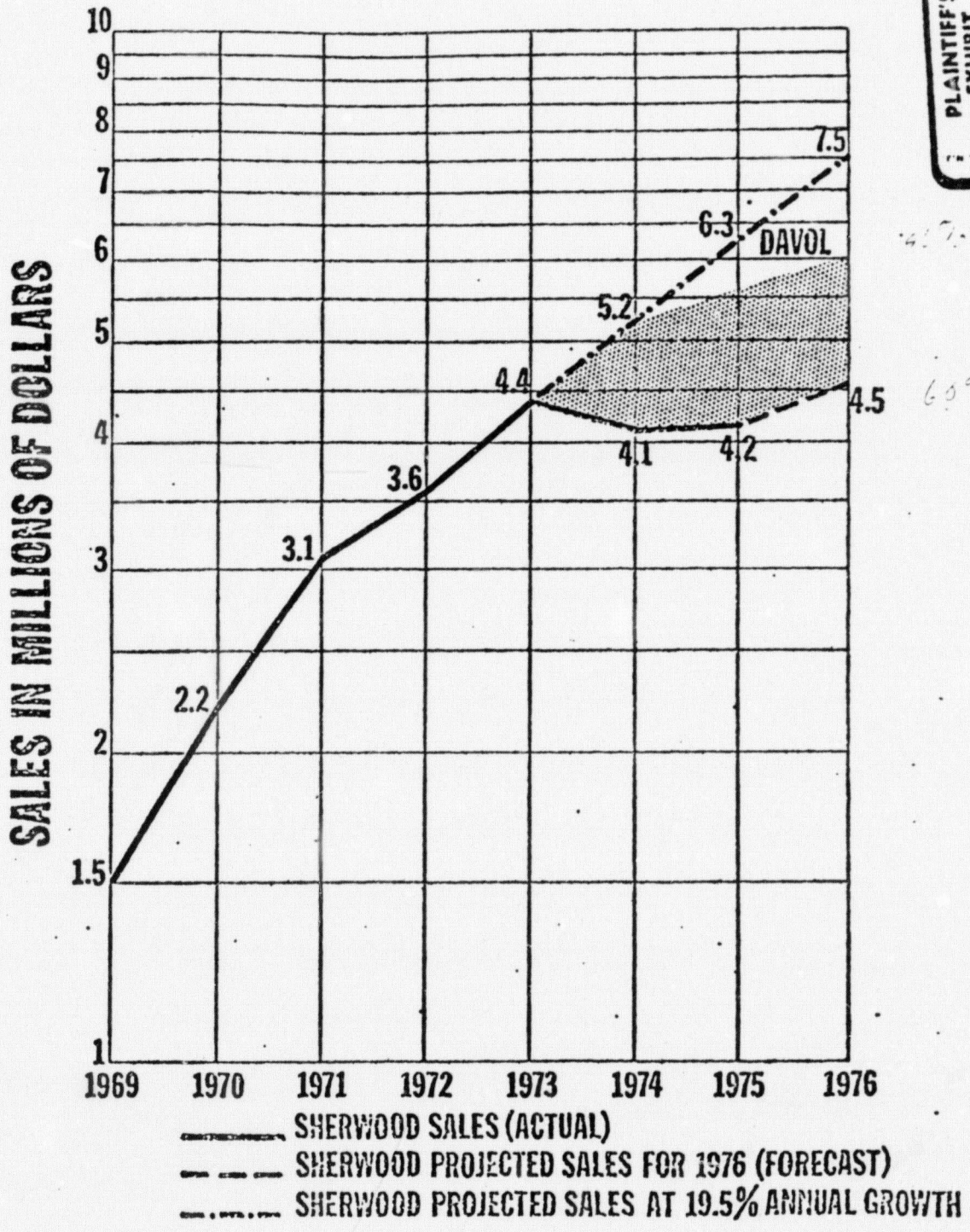


Exhibit 41

SHERWOOD MEDICAL INDUSTRIES, INC.
PROFIT MARGINS

	1974	1975	1976
Net Profits on clear conductive tubing before deducting allocated fixed expenses (as a % of net sales)	68%	67%	68%

	1974	1975	1976
Net profit on tube and catheter product line after deducti[illegible] allocated fixed expen[illegible] (as a % of net sal[illegible]	Est.35-40%	29.7%	Unavailable

T, 76?

Exhibit 43

NATIONAL CATHETER CORPORATION SALES

	1972-73	1974	1975	1976 (Jan/Feb)
Sales of Clear Conductive Tubing to AHSC	$529.968	$1,008,432	$782,628	Unavailable
Sales of Clear Conductive Tubing to all other Customers	164,032	143,879	69,372	Unavailable
Total Nat'l Catheter (Sales of Clear Conductive Tubing)	$694,000	$1,152,311	$852,000	$166,853

NATIONAL CATHETER CORPORATION MARGINS

Marquardt's analysis
for 9/1/75 - 2/29/76

Gross Profits (as of % of total clear conductive tubing net sales)	58%
Net Income — pretax (as a % of total clear conductive tubing net sales)	41%

Exhibit 62

11.2 M.S.C.

R- f- Natl Cath - 521

PX 62

AMERICAN HOSPITAL SUPPLY

TO: GROSSMANN - AHS/GO

DATE: June 12, 1972
FROM: FRANEY - AHS/GO
LTR. OF:
SUBJECT: Conductive Connecting Tubing

Fred:

Can you tell me where we stand on the National Catheter Conductive Connecting Tubing. Hopefully we will make a decision that will go with the product so that we can cash in on the 2.8 million dollar market that is alone controlled by Argyle.

Thank you.

B

Bart Franey

BF/2N/9

6/26 - Still sig OK to proceed - He rec'd letter from Natl Cath attorney -

Bubble Tubing 170

Exhibit "1"

Exhibit 63

522

AMERICAN HOSPITAL SUPPLY
DIVISION OF AMERICAN HOSPITAL SUPPLY CORPORATION

GENERAL OFFICES: 1450 WAUKEGAN ROAD, McGAW PARK, ILLINOIS 60085, PH. 312 689-8800

RECEIVED
NOV 20 1972
NATIONAL CATHETER CORP.
ARGYLE, N.Y. 12809

November 15, 1972

Mr. Sal Labruzzo
Office Manager
National Catheter Corporation
Hook Road
Argyle, New York 12809

Subject: Inventory Levels

Dear Sal:

Thank you for your letter and inventory recap of November 1, 1972. In reviewing the figures that you have supplied us, I noticed that four sizes of clear conductive tubing have been added to the inventory list older than six months. The total value of this conductive tubing is $18,704. If this sum were not included on the November 1 list, the amount due American Hospital Supply would be $9,635.

Sal, we are extremely close to the national introduction of clear conductive connecting tubes in all sizes and quite possibly you are not aware of the problems we have encountered in trying to introduce this line during 1972. Production has been delayed for one reason or another and I'm sure Dave or Ross will be happy to fill you in on those facts that you are not aware of. Instead of sending you a check for the $9,069 as listed on your letter or asking you to send us one for the $9,635 that would be due American without the conductive tubing, we would prefer to reconcile any inventory older than 6 months after the introduction of clear conductive tubing.

Best to you,

Bob

Bob Franey
Product Manager

djc
cc: Lehmkuhl - AHS/GO
Filek - AHS/GO
Leno - AHS/GO
Grossmann - AHS/GO

PLAINTIFF'S EXHIBIT
Dec 4/14/76
63 od

Ross Sheridan Exhibit 9 Odent
DATE 11-12-75 INIT. afh
Allen J. Hanley, C.S.R.
Sup. Crt. Stenog.

AMERICAN HOSPITAL SUPPLY

TO ALL AHS SALESMEN & SALESWOMEN
cc: All AHS Region Managers
All AHS Sales Managers
Grossmann - AHS/GO
Simmons - AHS/GO

DATE March 12, 1973
FROM B. FRANEY - AHS/GO
LTR OF
SUBJECT American Yankauer Suction Unit

Hi folks!

The Spring American Bulletin is being released to your customers on March 16; American Clear Conductive Tubing is being advertised in this issue and your sample kits are being prepared now. As you all know, we had to recall the 18194 series of [illegible] coils and this delayed introduction of the entire line; we are now in good shape and ready to begin delivery -- full speed ahead when you receive your sample kit.

As part of our introductory program, we are also promoting the American Yankauer Suction Unit. Your hospitals may receive a free case of Yankauers when they order two cases assorted of sterile American Clear Conductive Tubes, catalog numbers 18193-056, 076, 512, 520, 712, and 720. The non-sterile 18194 series is not included in the promotion.

To get the free case of Yankauers for your customers, just make sure they buy at least two cases of the 18193 series, then put the Yankauer Units (39853) through as a "no charge" sale; the cost has been reduced and you will have "zero" commissions deducted.

The free goods offer expires June 1, 1973; limit of no more than three cases of Yankauers for any hospital during the promotion. Customers who currently purchase the Yankauer Unit should be sold at existing prices unless they take advantage of the free goods offer.

Best to you,

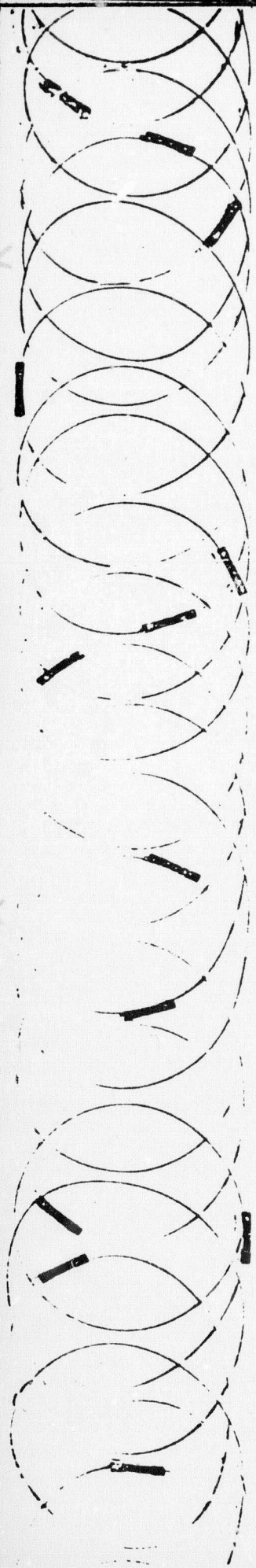
Bart

Bart Franey
Product Manager

BF:aaq

PLAINTIFF'S EXHIBIT
Recd 4/4/76
64

X-21



A CONDUCTIVE COIL...

Coil of clear conductive tubing is 100-ft. continuous length with connectors at 6-ft. intervals.

To make a connecting tube in any multiple of 6 ft. (i.e., 6', 12', 18', 24', etc.), cut the connector through the middle.

To make a connection between a sterile and non-sterile section, cut in the middle of the black female section and use the short, male conductive connector (included in package) to connect the two lengths.

No.
18194-050—AMERICAN™ Clear Conductive Connecting Tube, nonsterile. 5 mm (3/16) x 100', with connector every 6'. Packed 100' per case.
18194-070—Same, but 7 mm (9/32) x 100'. Packed 100' per case.

FREE OFFER ON YANKAUER SUCTION UNITS

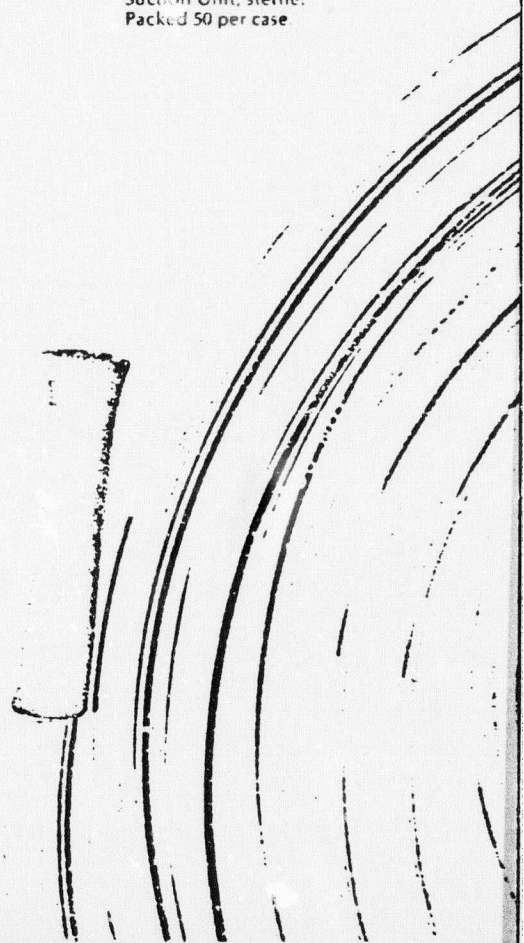
The AMERICAN™ Yankauer Suction Unit is a uniquely designed suction instrument. A whistle tip allows precise suctioning of the area and permits easy evacuation of fluids or clots. The lightweight, transparent plastic shaft allows clear observation of aspirated material.

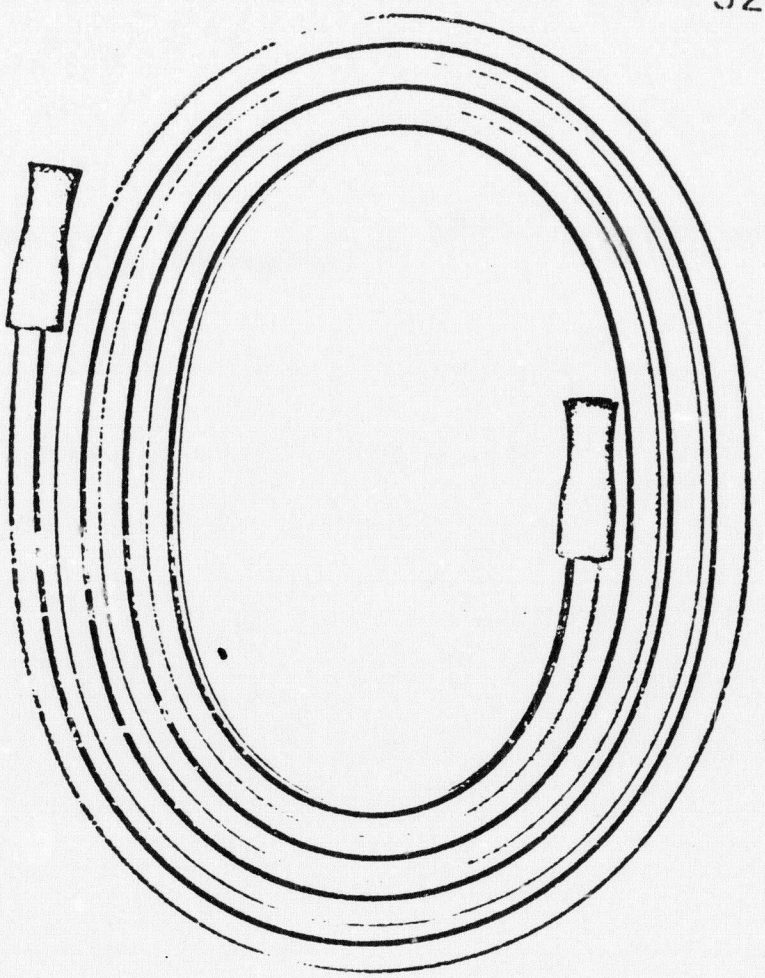
The Vactrol connector provides control of suction for added safety, and the malleable tip can be adjusted to any angle for hard-to-reach areas.

Disposable for greater safety, single-use eliminates the risk of infection from contaminated reusable handles.

You can have a free case of the Yankauer unit simply by ordering 2 cases assorted of the following AMERICAN Clear Conductive Tubes: Nos. 18193-056, -076, -512, -520, -712, -720. This offer expires June 1, 1973; limit of no more than 3 cases of Yankauers for any hospital during the promotion.

No. 39853—AMERICAN™ Yankauer Suction Unit, sterile. Packed 50 per case.



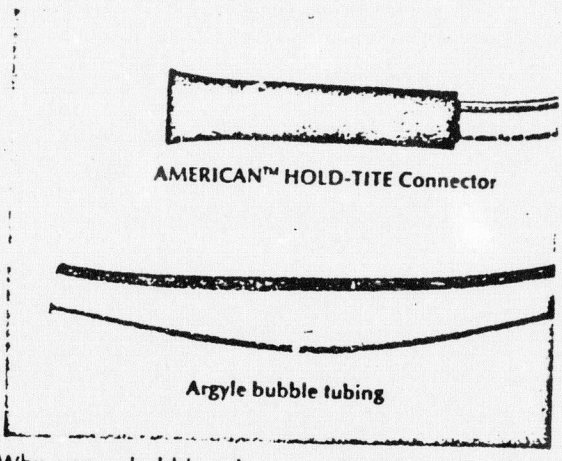


WHAT'S NEW IN *CLEAR* CONDUCTIVE TUBING?

AMERICAN™ *Clear* Conductive Connecting Tube is new and it's the only *clear* Conductive Tubing to provide a positive seal.

- UL-approved
- Competitively priced
- Precut lengths (6', 12', 20') are fitted with flexible HOLD-TITE connectors to provide a positive seal
- Aseptic transfer package on 12' and 20' lengths for sterile technique

No.
18193-056—AMERICAN™ Clear Conductive Connecting Tube, sterile. 5 mm (3/16) x 6'. Packed 50 per case.
18193-076—Same, but 7 mm (9/32) x 6'. Packed 50 per case.
18193-512—Same, but 5 mm (3/16) x 12'. Packed 10 per case.
18193-520—Same, but 5 mm (3/16) x 20'. Packed 10 per case.
18193-712—Same, but 7 mm (9/32) x 12'. Packed 10 per case.
18193-720—Same, but 7 mm (9/32) x 20'. Packed 10 per case.



Why use a bubble when our *flexible HOLD-TITE* connector gives you a *positive* seal?

Secure aseptic transfer package — no seams at the stress points to split open during shipment or handling.

526

Exhibit A

Brunswick CORPORATION
HEALTH & SCIENCE DIVISION.
ARGYLE, NEW YORK 12809
AREA CODE 518 638-8222

RECEIVED
OCT 17 1967
W. L. NIEMANN

October 9, 1967

Registered Mail

DEFENDANT'S EXHIBIT A Rec'd 4/3/72

Mr. John L. Willman
Health and Science Division
Brunswick Corporation
1831 Olive Street
St. Louis, Missouri 63103

Dear Mr. Willman:
Your letter dated September 19, 1967, in my view, constitutes a material breach of my employment contract and, while I am sorry that Brunswick has seen fit to terminate that agreement, I appreciate your frankness in advising me of the situation which now exists.

My employment agreement with the Brunswick Corporation provided that I was to be employed as head head of the catheter operation. That contract also provided a legal basis for termination in its numbered paragraph 2. However, Brunswick has chosen to ignore the requirements of that portion of the contract also.

In my recent letter to you I pointed to the confusion created by the existing organizational charts as compared to the status which I was supposed to have been occupying. Your letter in reply, dated September 19, 1967, disaffirms my employment contract and told me that Brunswick had relegated me to a position of limited responsibility and capacity.

In view of this material alteration of my status I have no alternative but to conclude that Brunswick has terminated my employment contract and that I am limited now to my efforts to enforce whatever rights I may have by reason of such termination by Brunswick. I do not intend to serve without a contract and will not accept the limited employment arrangement to which you have now relegated me in lieu of the employment agreement and position that I have had or by the contract have had the right to have.

Very truly yours;
David S. Sheridan

DSS/a

SDY-38

Exhibit B

527

(not admitted in evidence)

Brunswick CORPORATION

GENERAL OFFICES

September 24, 1963

Mr. David S. Sheridan
P.O. Box 147
Argyle, New York

Dear Dave:

Supplementing the agreement of February 26, 1960, Brunswick Corporation intends to employ you at least until February 26, 1965, and from year to year thereafter as long as Sheridan Corporation continues to operate in a satisfactory manner as at present; the only other qualification being that you give Brunswick no reason to discharge you for cause, which I'm sure you will never do.

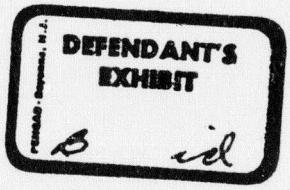
You will continue to function as President of the Corporation with all the responsibilities and authority of that office subject, of course, only to the direction of the Board of Directors.

My best to you.

Sincerely,

J. N. Willman
Vice President

JNW:ph



623 SOUTH WABASH AVENUE / CHICAGO 5, ILLINOIS, U.S.A. / WEbster 9-3000

DX-1

Exhibit G

528

D-19

Communication from
The President's Office

August 24, 1960

TO: All Hospital Men

DEFENDANT'S EXHIBIT
Rec'd 4/3/76
G

A SPECIAL REPORT REGARDING ARGYLE TUBES

Since this exclusive Aloe development has proven so spectacularly impressive, far beyond our most optimistic expectations, it seems proper and timely to give you an honest appraisal of where we stand and what our prospects are for the future as well as present deliveries. But more than that, I would like to discuss what the entire project is going to mean to us. Therefore, the following facts seem obvious as of today.

1. This is the finest line on the market, and our patents will not permit others to copy our most important exclusive features - not for years to come anyway. And we can boast with confidence that there has not been even one bad comment regarding the line, either from a prospective customer, a user, or anyone to whom it has been demonstrated.

2. We have the best scientific brain in the entire surgical plastic field in the person of Dave Sheridan. His genius is such that he was in demand by many people. Several fine firms had wanted to acquire him and we feel very fortunate that he is happily at home in our Company.

3. Dave's progress in other exclusive items to be added to the line is bound to be rapid and inevitable, but only as soon as we can free him from day to day production in order that he may devote his major efforts to research engineering and development. He already has a long list of items on which he wants to go to work.

4. We have already hard at work, Bob Cole, a young, experienced, plastics engineer who will take over as production and works manager.

5. We have, however, a very limited production facility. As you know, Dave's factory is clever and productive, but it is quite small. This means that, in spite of the fact that the men and women who work there are of the highest caliber, the facilities

are simply so limited that production cannot now come to more than three times the amount we had been using from Resiflex. Now, we are building an addition to the plant, but it is temporary only.

6. On some items, therefore, we are from time to time in a back order position.

7. In summary, we have in our hands a fine, wonderful project which is going to mean a great deal to your income and to our prestige, but which must quickly be expanded.

We now present the following steps to be taken as soon as humanly possible:

9. As above stated, we have almost completed enlarging the present manufacturing space so that within one month we will increase capacity 30%. While this is only a temporary measure, it will help.

10. The Board of Directors of Brunswick have authorized me to do whatever is necessary to increase production. This means an immediate expenditure of about $95,000 for additional machinery (extruders, blendors, granulators, automatic cutters, electronic sealers, etc.) and in addition a complete new factory to be built in Argyle which will be modern in every respect. Ground will be broken next Monday - completion in ten weeks.

11. Our sterile items now go to Wilmot-Castle in Rochester for gas sterilization and this, obviously, takes considerable time. We propose to do our own sterilization at Argyle, but, of course, this will have to wait for the new plant.

Now what are our delivery prospects? Well, depending upon what and how much we sell, we shall go along, with some items likely to be in a back order position from time to time, until the new factory is operating. Within six weeks, however, we will be up to four times the number of tubes per day we had been selling last year. Naturally we have no knowledge as to how many you will sell. We firmly believe that this quantity will prove inadequate. Our best guess at the moment is that when we get rolling you will sell ten times as much as our previous experience told us was possible, which is the initial production volume which the new plant will have as its first objective.

Now the delivery of new machinery, the building of a new plant, the special power lines for three-phase current which must be run by Niagara-Mohawk Power Company all the way from Glens Falls can take

place concurrently; but the total project adds up to about five months, or through the month of January. Therefore, it is fair to say that by the middle of winter, we will be on the beam.

In the meantime, I don't want to tell you to slow down, but I think you should know that we are likely to expect back orders on some items even though everybody is working with might and main, and that a good quantity of tubes is now going out of the plant each day.

We have a fine thing and we feel that we want you to be completely informed every step of the way, because even though deliveries may discourage you for a few months, you should be proud to know that we have an exclusive line that is so good that we really ought to have the market by the short hair.

Sincerely,

Howard Baer

531

Exhibit R

Brunswick CORPORATION

HEALTH AND SCIENCE DIVISION
INTERNAL COMMUNICATION

SUBJECT

DEPT.
LOCATION

David S. Sheridan

DATE September 19, 1967
COPIES TO

FROM
DEPT.
LOCATION

J. N. Willman

DEFENDANT'S EXHIBIT
Rec'd 4/13/76
L

CONFIDENTIAL

Dear Dave:

I don't know why you are experiencing difficulty in performing your duties as head of Sheridan due to "confusion" created by some organization chart, as there is no confusion in my mind concerning our arrangement.

As head of Sheridan your duties are, under the general guidance of the marketing units here, to spearhead product development in the Sheridan and Argyle product lines. You have no other duties. On the other hand, all the people at Argyle, other than you and your product development staff, report directly to Ben Kliss, plant manager, who, in turn, takes direction from Joe Scalise, as you know.

Should you take it upon yourself to issue an organization chart, which prerogative belongs to this office here of course, and if it varies from the foregoing, it would simply be necessary for me to repudiate it before our people at Argyle and elsewhere. Furthermore, an organization chart does not, of itself, define duties anyway.

Actually, I can't see the necessity for all this discussion on the subject in view of the fact that we are not operating the Argyle plant any different in principle today than we have operated it for a number of years in the past.

Sincerely,

J. N. Willman

JNW:ph

1) dragt in correspondence file

Exhibit S

532

RECEIVED
SEP 21 1967
KENYON, PALMER, STEWART AND ESTABROOK

September 16, 1967

DEFENDANT'S EXHIBIT
Rec'd 4/13/76
S

Mr. John N. Willman
Health and Science Division
Brunswick Corporation
1831 Olive Street
St. Louis, Missouri 63103

Re: Sheridan Division
Organization Chart

Dear John:

From time to time, I experience difficulty in performing my duties as head of SHERIDAN HEALTH AND SCIENCE DIVISION of Brunswick Corporation due to confusion created by existing organization charts. As I have verbally called to your attention, my position in the organization does not show on the charts due to error of omission or other unexplained reason.

The employment agreement of February 26, 1960 between myself, Brunswick and Sheridan Catheter & Instrument Corp. provided that I would be employed as head of Sheridan Catheter. Although there have been some proposals to alter this, no written agreement to this effect has ever been executed between myself and Brunswick. This situation was not altered by the merger of Sheridan Corporation into Brunswick Corporation as confirmed by your telegram of November 17, 1966 and this fact formed a part of the deliberations at the meeting of the Board of Directors on November 22, 1966 when action was taken effecting the merger.

In an effort to eliminate the problems of confusion caused by existing charts, I am taking steps as head of Sheridan Division to issue and circulate within the company a new organization chart which includes myself and indicates my position to be the person in over-all charge to whom all other personnel working at Argyle will be responsible.

If you have any comments concerning the above or suggestions for inclusions in the new organization chart please let me hear from you.

Very truly yours,

David S. Sheridan
President

DSS/ds

S-6

Exhibit T

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM (04)

201 (4-60)

W. P. MARSHALL, PRESIDENT

DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

SYA138 SA318

1966 NOV 17 PM 7 39

S LLR364 PD 2 EXTRA=FAX ST LOUIS MO 17 335P CST=

DAVID S SHERIDAN= SHERIDAN CORP

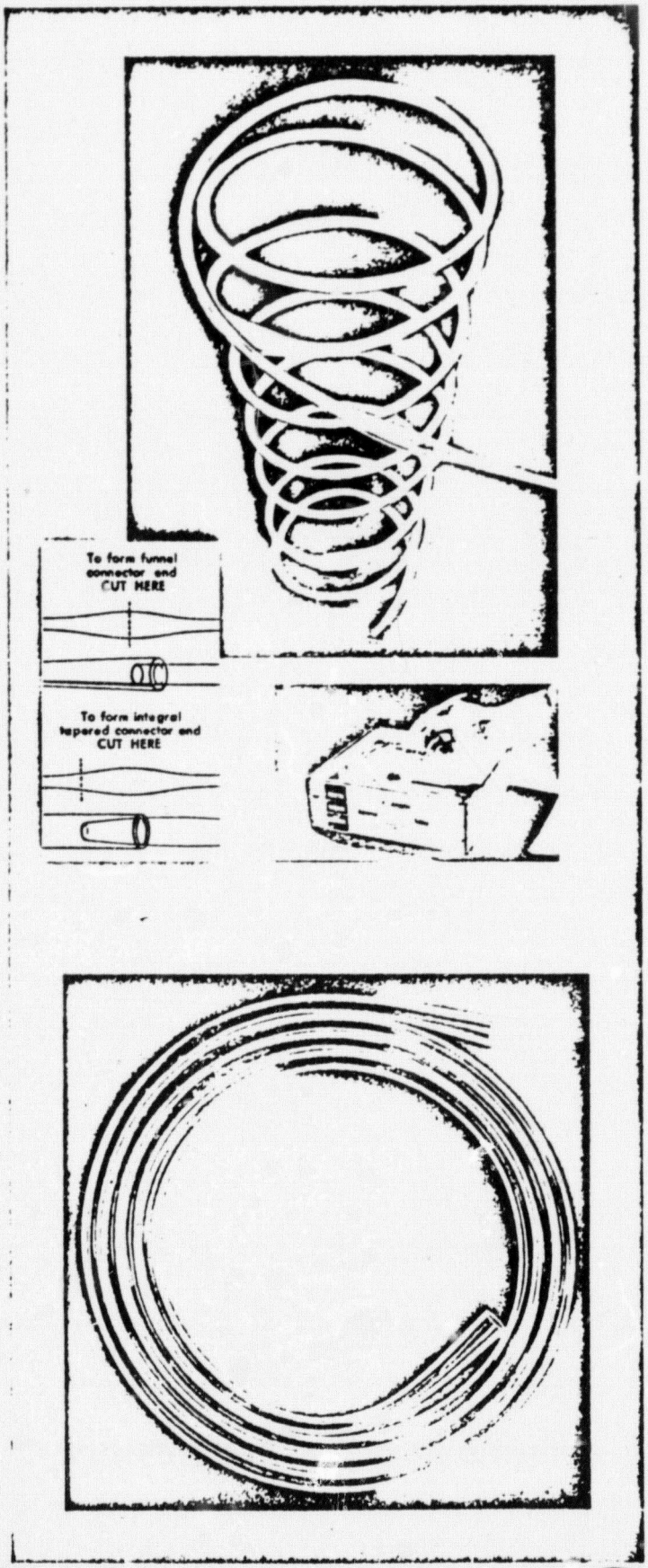
ARGYLE NY=

=THIS WILL CONFIRM MY STATEMENT TO YOU THAT THE MERGER OF SHERIDAN CORPORATION INTO BRUNSWICK CORPORATION WILL NOT AFFECT OR ABRIDGE YOUR RIGHTS UNDER ANY EXISTING CONTRACTS WITH BRUNSWICK CORPORATION OR SHERIDAN CORPORATION=

BRUNSWICK CORP J N WILLMAN VICE PRESIDENT=(

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

DEFENDANT'S EXHIBIT
Rec'd 4/18/76
T cd



argyle®

Conductive Bubble® Tubing

(U.L. Approved)

This is the same as plain Bubble Tubing described on preceding page except for a thin line of conductive material which runs full length. Packaged in 100 ft. lengths. UL listed for use in vicinity of explosive gases.

Cat. No.	Lumen	Funnel Accepts O.D.	Taper Fits I.D.	Lgth.
MAR2902	3/16"	3/32" to 5/16"	3/32" to 3/8"	100 ft.
MAR2904	1/4"	3/32" to 5/16"	3/32" to 3/8"	
MAR2906	5/32"	5/16" to 7/16"	5/16" to 1 3/32"	

argyle®

Conductive Connecting Tubes

(U.L. Approved)

These are convenient cut lengths of Conductive Tubing as listed above except without intervening bubbles. Individually packaged. Sterile

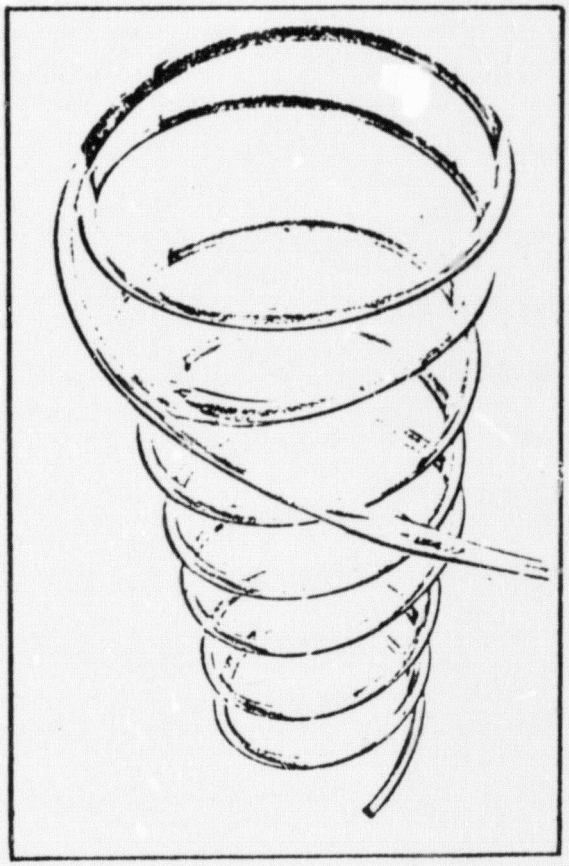
Cat. No.	Lumen	Ends	Lgth.
MAR2930-6	3/16"	Funnel connector on one end, tapered connector on other.	6 ft.
MAR2930-12			12 ft.
MAR2930-20			20 ft.
MAR2934-6	5/32"		6 ft.
MAR2934-12			12 ft.
MAR2934-20			20 ft.

ALOE MEDICAL

Exhibit W

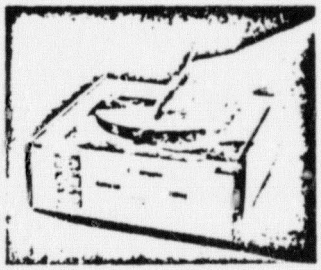
MEDICAL TUBES
Bubble Tubing 1/2

April 21, 1969



PLAINTIFF'S EXHIBIT
4/13/76

DEFENDANT'S EXHIBIT
Rec'd 4/13/76



ITEM:

ARGYLE Conductive Tubing (Sterile lengths and bulk)

MAR 2930-6, MAR 2930-12, MAR 2930-20, MAR 2934-6, MAR 2934-12, MAR 2934-20, MAR 2902, MAR 2906, and MAR 2904

DESCRIPTION:

ARGYLE Conductive Tubing is polyvinyl chloride tubing which contains a black conductive line running the full length of the tubing. This line is blended into the polyvinyl chloride itself and is an integral part of the tube.

MARKET OPPORTUNITIES:

Approximately 13,000,000 operations are performed annually in this country. We estimate a hospital will do approximately 17 operations per bed, per year. This means a 100-bed hospital will do about 1,700 operations per year. At least 1,500 of these should use our conductive tubing. This gives a 100-bed hospital a potential market of 1,500 pieces or between $1,500 or $2,000 per year.

MEDICAL APPLICATION:

In certain areas of the hospital (primarily O.R. and O.B.) conductive tubing is needed due to the types of liquids and gases that are being transported. Generally, this need arises because the liquid or gas being transported is highly inflammable and even a spark of static electricity can ignite the material, causing an explosion. It is imperative that the tubing possess conductive properties which will constantly "drain off" any electrical charge before it is allowed to build up.

This is especially true in O.R. because many of these gases which are used to anesthetize the patient are highly inflammable.

Not only must the tubes which carry the inflammable gas be conductive, but also other tubes which are in the area must be conductive. This includes tubes used for suction (suction catheter, Poole and Yankauer) and tubes used for drainage.

FEATURES AND BENEFITS:

-- U. L. approved as to conductivity - This tubing has been tested and approved by Underwriters Laboratories and is listed under their File No. MH7664, dated January 15, 1962. Their approval indicates that this tubing is safe for use in the presence of explosive (non-atmospheric) gases, which are found in the hospital operating room.

-- Water white clarity - This tubing possesses the usual outstanding ARGYLE water white clarity except for a line of black conductive material. The operator can see what is passing through the tube and if it were to clot, he can see the clot and "milk" it out.

-- Broad line available - Bulk Tubing - The bulk tubing is packaged clean in 100' coils in easy dispensing boxes. This is ideal for use from suction machine or wall suction outlet to edge of sterile field.

Sterile Cut lengths - Conductive tubing is available in sterile cut lengths in 6', 12', and 20' lengths. These are ideal for use in the sterile field to connect either directly to the source of suction or to another tube which leads to the suction source.

FEATURES AND BENEFITS (CONTINUED):

-- Exclusive integral connector - Bulk Tubing - This tubing contains the ARGYLE Bubble every 36". Cutting this bubble in the middle will produce a funnel end connector. Cutting the tubing adjacent to the bubble will produce an integral connector. The proper use of this will eliminate the need for connectors. This also eliminates the leading edge of the connector which can cause clots.

Sterile cut lengths - Available in 6', 12', and 20' lengths. Designed to reach from operating table to suction source.

COMPETITIVE INFORMATION:

Your principal competition is:

Black Rubber Tubing -- black conductive rubber has been generally acceptable because it is conductive and flexible, but primarily, because it was the only conductive tubing available. Its disadvantages are:

Heavy -- due to the wall thickness, the tubing is very heavy. ARGYLE Conductive Tubing is very light.

Dirty -- the carbon black content rubs off on people that are using it. ARGYLE Conductive Tubing, made of polyvinyl chloride, is very clean.

Due to the high carbon content, the tube is more coarse than other rubber tubing. This means it absorbs more of the material which is passing through it. This is impossible to adequately clean before sterilizing, and you end up with sterile "gunk" in the tube. ARGYLE Conductive Tubing, which you use one time and throw away, does not have this serious problem.

Due to coarseness of the tube, "gunk" passing through the tube can grab to the side of the tube and cause a clot to develop and plug up the tube during surgery. With the ARGYLE Conductive Tubing, the inside wall is satin smooth and has a non-wetting slick surface which makes it very difficult for anything to stick to the sides.

Connectors must be used with black rubber tubing which forms a leading edge with the lumen of the tube, which is an excellent place for clots to develop. When the exclusive ARGYLE Integral Connector is used properly, this is not possible.

Due to the black rubber tube, when a clot develops, it is very difficult to locate the clot. With the water white clarity of the ARGYLE tube, in the unlikely event of a clot developing, it is easy to locate and "milk" free.

After continuous cleaning and autoclaving of black conductive tubing, the tube can lose its conductiveness. This is impossible with the disposable ARGYLE Conductive Tubing.

SELLING SUGGESTIONS:

The key people for ARGYLE Conductive Tubing are:

Operating Room Supervisors
Anesthesiologists
All Surgeons -- General, Thoracic, etc.
Obstetricians
General Practioners

The key selling features of the ARGYLE Conductive Tubing are:

--Disposability -- use one time and throw away -- NO danger of cross infection.

--No problem with cleaning, autoclaving.

--No need for connector to restrict flow with lumen. No problem cleaning and keeping up with connector.

--Stress UL approved conductivity. This is a real plus for us.

--Stress water white clarity of the ARGYLE tubing as this makes it possible to see what is passing through the tube.

--Due to the non-wetting surface of the ARGYLE Conductive Tubing, it is very difficult for a clot to develop within the tube. If a clot should develop, it is easy to see and "milk" the clot out.

--Point out the wide variety of sterile lengths 6', 12', and 20'.

--Point out that the 100' roll is packaged clean with a bubble every 36" which allows the user to cut the desired lengths.

Sell the ARGYLE Conductive Tubing with other related ARGYLE items, such as the Yankauer, Poole, and Suction Catheters. Don't sell a product -- "Sell the System."

PRICING:

Catalog Number	Length	Lumen Size	Sterile or Clean	1-9 Ctn.	10 or More Ctn.
MAR 2930-6	6'	3/16	Sterile	$ .79	$ .69
MAR 2930-12	12'	3/16	Sterile	1.75	1.55
MAR 2930-20	20'	3/16	Sterile	3.07	2.67
MAR 2934-6	6'	9/32	Sterile	1.36	1.15
MAR 2934-12	12'	9/32	Sterile	3.00	2.55
MAR 2934-20	20'	9/32	Sterile	5.20	4.40
MAR 2902	100'	3/16	Clean	11.45	9.95
MAR 2906	100'	9/32	Clean	22.50	19.40
MAR 2904	100'	1/4	Clean	18.80	16.30

PACKAGING:

MAR 2930-6 Paper-to-poly peel-back, 50 to a carton.
MAR 2934-6 Paper to-poly peel-back; 50 to a carton.

PACKAGING (CONTINUED):

MAR 2930-12 MAR 2930-20 MAR 2934-12 MAR 2934-20	Box with Central Supply wrap -- paper bag; 10 to a carton.
MAR 2902 MAR 2906 MAR 2904	100' coil in dispensing box.

CODE:

"A"

STOCK:

In stock at all branches.

NOTICE: Two questions come up from time to time about our conductive tubing.

Question: 1. What does the notation on the MAR 2906 mean which says:

"Do Not Fill with Ethyl Ether"

Answer: 1. This means you are not to pour liquid ethyl ether into the tube. The tubing can be used in the presence of ethyl ether vapors. Normally, the tubing would only be used in the presence of ethyl ether vapors as it might pass from the vaporizer on a gas machine to the patient and in that connection escape into the air around the surgical field.

The statement is only necessary on the 3/16" size because of its thinner wall.

The statement is nothing to become alarmed about, but you should know what it means.

Question: 2. When connecting two ARGYLE Conductive Tubes together, do the conductive lines have to touch for the line to be conductive?

Answer 2. Tests have proven it makes no difference whether the black lines touch or not. It is conductive both ways.

ALOE MEDICAL

540

Exhibit Y

DISTRICT SALES MANAGER'S
Weekly Activity Report

TO: NATIONAL SALES MANAGER

cc: ASSISTANT NATIONAL SALES MANAGER

FROM J. W. HEUBEL

WEEK ENDING 6/17/72

MONDAY SALESMAN Williamson CITY Springfield - Pittsfield

New salesman - doing well - getting into departments making headway - Accent on Argyle & Clasma Products.

TUESDAY SALESMAN Williamson CITY Pilgrim - Wake - Springfield - Holyoke

Same comments as above.

WEDNESDAY SALESMAN Workman CITY Tewksbury, New Boston, Hartford.

Problems with Conductive connecting tubes. - Customer wants Two Funnel connectors - losing business to NCC. Will need Twin Funnel connectors as Standard — too expensive as custom.

Good Pharmacy presentation and projects at New Boston General.

THURSDAY SALESMAN Reeder CITY Waltham - Hospital

Major presentation to Dir. of Nurses. Clin. Eval. Station evaluation starting next Tuesday.

DEFENDANT'S EXHIBIT Recd 4/15/76 Y id

FRIDAY SALESMAN [illegible] CITY Boston Area

Also Mini meeting of Local Salesmen in 1 to 5PM

ATTACH ADDITIONAL PAGE FOR FURTHER CC

National Sales Manager

BEST COPY AVAILABLE

Total Salesmens Reported Sales $ 8591.8 – one Vacation

Salesmens Net Sales (Less Standing Orders) $ 8580

1. DISTRICT STATUS REPORT

Nice new business showing but weekly incoming total down. Argyle, Disp. & Taylon Promotion should help and Kit Contest is generating enthusiasm.

2. MONOJECT Conversions

Our Lady of Fatima Joined St Es. Hsp in purchasing Magt Size Asst. (3001)
Leonard Morse Hsp – Floor units removed - In service in process

3. ARGYLE Kits & Tray Conversions

Levin Kit - Longwood Hsp - 3012
Medicuts - Somerville Hsp 3012
Tracicuts - Groton Manor 3012
Closed Drainage Sets. Nashoba Hsp 3045

4. CLARION

Standing Order Urinals - Ch - 3000 Hsp - Lynn Hsp (3001)

5. PIONEER Conversions

Beaconsfield Hospital - Pioneer 123 gloves - (3001)

6. TRYLON

Union Hsp - New Bedford - 31 Spgs. Trylon (3003)
Dressing Shears – N.E Hsp Sandham (3002)

7. CITADEL/GRENADIER

60 Summit Bedside Cabinets & 60 Citadel O.B Tables - Yale New Haven (3001)

8. Other Problems Encountered (excluding product problems)

6' Lengths Aspiration Tubing and Yankauer Sets should also be available with Double Funnel ends as standard.

ALOE MEDICAL

542

Exhibit AE

DISTRICT SALES MANAGER'S
Weekly Activity Report

TO: NATIONAL SALES MANAGER
cc: ASSISTANT NATIONAL SALES MANAGER
FROM Joe Sullivan
WEEK ENDING 5-4-73

MONDAY SALESMAN Tom McWilliams CITY Wisconsin

Tom is breaking loose. This year should prove out to be a profitable one for him & the company. Tom is really getting to the people up there.

TUESDAY SALESMAN Tom McWilliams Wisconsin

Wrote $10,000 ADM at Manmette Wisc. Tom has done an outstanding job here. When I made the first call with him here all we could find to talk to were the bushes in front of the hospital.

WEDNESDAY SALESMAN Jack Blake CITY

Lunch w/Sam Nannetti.

DEFENDANT'S EXHIBIT
Rec'd 4/13/76
AE

RECEIVED
MAY 8 1973
JACK H. BLAKE

THURSDAY SALESMAN Office CITY

FRIDAY SALESMAN Bob Poisel CITY Rockford

Bill Nelsen + I joined Bob at Rockford Mem'l to discuss yearly bid on gloves, syringes + tubing + kits Also discussed possibility of contract

ATTACH ADDITIONAL PAGE FOR FURTHER COMMENTS

National Sales Manager

Salesmens Reported Sales $ 121,482

Salesmens Net Sales (Less Standing Orders) $ 71,027

543

1. DISTRICT STATUS REPORT

Census is starting to slump. New business coming in looks good. I am quite hopeful that this will help us to pull the district through the summer months at 100%+ + really cash in during the 4th quarter.

2. MONOJECT Conversions

3. ARGYLE Kits & Tray Conversions

4. CLARION

2 new ADM standing orders.

5. PIONEER Conversions

6. TRYLON

7. CITADEL/GRENADIER

8. Other Problems Encountered (excluding product problems)

American went into Hosp Chic w 20' tubing w conductive line undercut us $6/ea. Norb is getting samples & literature [illegible] Mark has cost net with Hosp surgery.

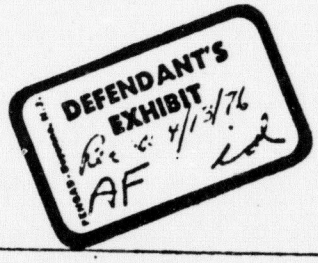
ALOE MEDICAL

544

DISTRICT SALES MANAGER'S
Weekly Activity Report

TO: NATIONAL SALES MANAGER Exhibit AF
cc: ASSISTANT NATIONAL SALES MANAGER
FROM Joe Sullivan
WEEK ENDING 5-25-73

MONDAY SALESMAN Office CITY



RECEIVED
[illegible]
JACK A. BLAKE

TUESDAY SALESMAN Cichon CITY Chi
things are really going well at St Anns w/ Association contract
Norb has already set up an argyle display and "phased in"
quite a few new argyle products. We should also have
conversion on PAK & undergads in next few weeks.

WEDNESDAY SALESMAN Jack Blake CITY
Called on Warren Rhodes Coordinator Group Purchasing Mercy Hos
to discuss contract. Meeting went quite well. Jack will get
back to myself & Warren in couple of weeks with proposal
for contract on Argyle only. We will establish success in MAR
first & later add Trylon and Monoject

THURSDAY SALESMAN Cichon CITY Chi
Main call was at U of I where American is trying to take
$50,000 in tubing business with their new Sheridan tube.
& they are evaluating. At this point it looks like we will need
to meet price. OR S expressed feeling of being "had" on argyle price
for last 10 yrs. Believe we pretty well overcame this at end
of interview

FRIDAY SALESMAN Sales Meeting CITY
One topic discussed was Americans' new conductive
tubing. Comments & suggestions are covered in separate
letter

National Sales Manager

ATTACH ADDITIONAL PAGE FOR FURTHER COMMENTS

Salesmens Reported Sales $ ~~83972~~ 91,122 545

Salesmens Net Sales (Less Standing Orders) $ 83972

1. DISTRICT STATUS REPORT

2. MONOJECT Conversions

3. ARGYLE Kits & Tray Conversions

1- nemorit conversion
1- Foley kit conversion
1- Irrigation kit conversion

4. CLARION

Picked up underpad business at 8 hospitals Northern Ill Purtow... ied was tied at 11.90/s. between American + ourselves. The fact that we were awarded business is a credit to Bob Poisell.. With our special cost on this order we have 15% gross in...

5. PIONEER Conversions

1- Clarion conversion
Graham Hosp
Keokuk, Iowa (90 beds)
this acct will start ordering in 3 to 4 wks when present supply is depleted

6. TRYLON

7. CITADEL/GRENADIER

8. Other Problems Encountered (excluding product problems)

ALOE MEDICAL 546 *Departmental Communication Blank* Exhibit AG

TO BILL NELSEN FROM RAY GOFF DATE 5/29/73

SUBJECT STATE OF DISTRICT - MAY

Dear Bill:

May was a month of change in the District, most of the changes being to our advantage.

Howard Valentine resigned as Director of Purchasing at Methodist Hospital, New Orleans to become administrator of Hancock General Hospital, Bay St. Louis, Miss. Howard is a very good friend of ours and will help us at this hospital.

He was replaced at Methodist by Victor Palazola who was formally at Mercy, New Orleans as purchasing agent. He is anti-Aloe which is why we did no business at Mercy. Its a toss up as to what his attitude will be at Methodist. We have been the vendor of choice there and he knows this. We are going to watch the situation very closely and should business start dropping off I'll go see the Administrator, Paul Bjork, who is a friend of mine of many years duration.

Rex Gilmore was the Director of Purchasing for the two Baptist Hospitals in Birmingham. He is no friend of ours or of any National House. He did most of their business with Gentec. He would not permit us to bid. For some time everyone has felt that "payola" was going on. Last Friday he was suddenly fired and the story is being told that he was "caught".

Paul and I feel that we will have a chance to do business now in these hospitals.

Carraway Methodist has been evaluating our Urinary Care Trays and Enema Buckets and it looks like we stand a good chance of getting this business. I spent ½ a day there Thursday trying to push it through. We will probably have an answer this week. They aren't evaluating any other products other than ours.

Anniston Memorial, Anniston , Ala. is also evaluating. They are looking at ours, Cutter, Pharmaseal, Mac-Bick, Travenol and Bard, which they are presently using. How this one will go remains to be seen.

The American Salesman in Fred Matherne's territory is really going after the conductive tubing business and Fred has lost all of his business. What are we going to do about our pricing? Lets don't sit by and lose most of our business before reducing our price and then trying to regain lost business. Its much harder to get it back after losing it.

RECEIVED

MAY 31 1973

BILL NELSEN

DEFENDANT'S EXHIBIT Rec'd 4/13/76 AG

It seems as though we can't stabilize our pricing on Monoject due to independent distributors going after our business and forcing us to reduce pricing to retain business. Bedsole is now going after us . This outfit only uses Monoject as a convience as they push Jelco. They will take a Monoject account on price and then try to convert it to Jelco. The Monoject Rep. , Jimmie Jones, is aware of this but can't see to do anything about it.

Incoming business is a bit stronger this month, thank goodness. How we on shipped business I really don't know since the last report I have so was for the week ending May 4th.

Regards,

Ray

Exhibit AH

ALOE MEDICAL

548

DISTRICT SALES MANAGER'S
Weekly Activity Report

TO: NATIONAL SALES MANAGER
cc: ASSISTANT NATIONAL SALES MANAGER
FROM C.F. BEACHAM
WEEK ENDING 6-30-73

MONDAY SALESMAN _____ CITY DALLAS

OFFICE WORK - DALLAS

DEFENDANT'S EXHIBIT Rec'd 4/13/76 AH

TUESDAY SALESMAN [redacted] CITY DALLAS

OFFICE WORK - DALLAS
VARIOUS BIDS + QUOTATIONS, PLUS ROUTINE PAPERWORK - INCREASED LOAD GENERATED BY NEW SALESMEN.

WEDNESDAY SALESMAN MIKE KING CITY SAN ANTONIO

CALLED WITH MIKE KING IN SAN ANTONIO. SHOWED MEDICUT FILM WITH LOUIS SHULTZ (SHERWOOD) AT BEXAR CO. HOSPITAL. HOSPITAL IS USING MEDICUTS IN SURGERY + MIKE IS TRYING TO GET THEM TO THE FLOOR. CALLED ON BROOKE ARMY MEDICAL CENTER AND DISCUSSED SUCTION CATHETERS WITH CS SUPERVISOR ABOUT SUCTION CATHETERS - AHS HAS TAKE OUR BUSINESS AWAY FROM US - WE WERE SELLING SCOTSMAN + ARGYLE IN LARGE QUANTITY - AHS PRICED THEIR STRAIGHT CATHETER AT .26 EA + THEIR VAC-TROL CATHETER AT .30 (BOTH OF THESE ARE NATIONAL CATHETER PRODUCTS) WILL DISCUSS THIS FURTHER WITH BILL NELSEN. DISCUSSED TERRITORY WITH MIKE, AND LEARNED OF A NUMBER OF THINGS HE HAS WORKING WHICH SHOU CAUSE HIS PERFORMANCE TO QUOTA TO IMPROVE - MIKE'S ATTITUDE IS GOOD.

THURSDAY SALESMAN RON BAILEY CITY OKLAHOMA CITY

CALLED WITH RON BAILEY ON ST ANTHONY'S HOSP, MIDWEST CITY HOSP, SOUTH COMMUNITY HOSP., HILLCREST OSTEOPATHIC HOSP + UNIVERSITY OF OKLA. MED. CENTER. ALSO CALLED ON STATE PURCHASING OFFICE - PURCHASING FOR UNIV MED CENTER WILL BE HANDLED BY STATE PURCHASING OFFICE IN THE FUTURE, AND THIS SHOULD IMPROVE OUR CHANCES FOR BID AWARDS. IN THE PAST, WE HAS BEEN TURNED DOWN ON A NUMBER OF ITEMS EVEN THOUGH WE WERE LOW. RON IS STARTING OUT VERY WELL AND SHOULD DO A REAL FINE JOB IN HIS TERRITORY AS SOON AS HE BECOMES FAMILI WITH HIS TERRITORY - I'M PLEASED WITH HIS ATTITUDE, HIS WILLINGNESS TO LISTEN AND LEARN MAKES IT EASY TO BREAK HIM IN ON HIS NEW JOB. WROTE ROUTINE BUSINESS IN SEVERAL ACCOUNTS.

FRIDAY SALESMAN JOHN SPICER CITY TULSA

CALLED WITH J. SPICER IN TULSA - DISCUSSED SARATOGA SUMP + INGRAM TROCAR WITH ORS AT OKLA. OSTEO HOSP - MYELOGRAM TRAY AT HILLCREST HOSPITAL + I.D. BRACELETS AT HILLCREST. DISCUSSED ITEMS FOR UP-COMING BID AT BAPTIST MEM. HOSP, SAPULPA, OKLA. WROTE ROUTI BUSINESS. DISCUSSED TERRITORY SITUATION WITH JOHN - HE HAS LOST SOME BUSINESS (1100 CA CL109 UNDERPADS AT $0.16 - OKLA. NHS) BUT IS PICKING UP SOME (PEAK $1,000 HILLCREST HOSP. TULSA) TO MAKE UP FOR THE LOSS - AND HAS A GOOD ATTITUDE. HIS TERRITORY WILL SH ADDITIONAL BUSINESS LAST HALF OF 1973 ATTACH ADDITIONAL PAGE FOR FURTHER COMMENTS

Salesmens Reported Sales $_____ — NOT AVAILABLE

Salesmens Net Sales (Less Standing Orders) $_____

1. DISTRICT STATUS REPORT

OUR BUSINESS IS DOWN, BUT I DONT' FEEL IT WILL DROP FURTHER - RATHER SHOULD START BACK UP - NEW ARGYLE CATALOG IS A REAL JEWEL, AND COULD HAVE COME AT A MORE OPPORTUNE TIME. LOOKING FORWARD TO RECEIVING MY SUPPLY FOR DISTRIBUTION.

COMPETITION — PRICE AND OR PACKAGE SALES ARE CROPPING UP ALL OVER THE DISTRICT. THIS IS REALLY PUSHING DOWN SHERIDAN'S TUBING & CATHETER LINE - WITH EMPHASIS ON THE CONDUCTIVE TUBING - SALESMAN ARE CLAIMING ALL TUBING LEAKS (BUBBLE CONNECTOR) AND IS ONLY CONDUCTIVE IF COND LINES MESH AT CONNECTION POINT. AM ADVISING MY MEN TO SELL OUR "SYSTEM" OF

2. MONOJECT Conversions

BUBBLE TUBING AND NOT LET THEM GET AWAY WITH THEIR GIMMICK SELLING.

SALESMANAGER COPIES OF ORDERS ARE MISSED — NO WAY TO TELL AT END OF WEEK WHAT MAJOR SALES HAVE BEEN.

3. ARGYLE Kits & Tray Conversions

4. CLARION

5. PIONEER Conversions

6. TRYLON

7. CITADEL/GRENADIER

8. Other Problems Encountered (excluding product problems)

Exhibit AI

ALGE MEDICAL

Departmental Communication Blank

TO BILL NELSEN FROM CHUCK BEACHAM DATE 8/7/73

SUBJECT VARIANCE REPORT - JULY 1973

RECEIVED
AUG 3 1973
BILL NELSEN

Dear Bill:

July business seemed to just about hold at the June level. That's not good, but I still see signs of our beginning to start the curve upward. Compared with July 1972, if you back out ET and PR to the tune of $42,000, the 1973 figure looks a little more respectful, for we are under July 1972 by $12,000 in total business. Although we haven't made sufficient progress - we are improving on the dollars of Family Brand merchandise, and this will continue.

FAMILY BRANDS

MONOJECT

Only one small hospital (45 bed - Yoakum Co., Denver City, Texas) converted. Seton Hospital at Austin should be converted at anytime, as has been reported previously. Present holdup seems to be purchasing (Louis Christensen) but Nursing Service and Central Service hope to over rule and convert from Pharmaseal.

Hotel Dieu (DOC), El Paso, Texas looks great at present for re-conversion from Pharmaseal back to MONOJECT, Mike Woodin, Sherwood Salesman, and Jerry Mc Fadden have stayed close to this one. Mike obtained a cost study which proved that savings on Pharmaseal over MONOJECT were not as the Pharmaseal people had projected them to be.

Present holdup is desire of hospital to have a large Syringe Destructor to be located in C.S. -- we must furnish this item in order to get business back. John Wilsher is working on this now and re-conversion should come through soon.

No further developments in the Houston situation - Harvey has not heard from Hermann Hospital or any of the other hospitals he quoted and the same goes for Brian Anthony.

Kit business is about the same - and additional emphasis will be placed on this product line for the balance of the year.

ARGYLE

Some ups - and some downs this month. American Hospital Supply is getting some of our cut-length conductive tubing business and our salesmen must stay close to this situation and sell back with the superior ARGYLE product. We are also losing a lot of suction catheter business on price - the new line of catheters that we saw in Denver will certainly be welcome when available.

DEFENDANT'S EXHIBIT
Rec'd 4/13/76
AI

Kit business dollar - wise for July was at the same level as for June. However, I am encouraged by the additional number of customers showing up on the St. Joseph print out. Ron Bailey and Lee Fortune are showing some increases in Kit sales and several new accounts have been picked up by other salesmen - notably Harvey Barber's sale of MAR-2590 to the V.A. Hospital in Houston.

Medicut sales were up over July and back at the May level. As Jack Blake stated - we are flat on this item - hope the contest helps (and it will).

Venocut - Venocut Short and Venocut Plus are just not coming through as they should - I keep talking and pushing, but can't seem to get any real motion.

Ingram Trocar started fast and hopefully we'll do the type job this fantastic product deserves.

No real impact has been noticed as yet from ARGYLE catalog distribution, but this should be noticeable by the end of August.

DISPOSABLES

Clarion Glove evaluation at Parkland Hospital, Dallas, Texas is news of the month in this category. They bought 813 dozen for the evaluation and all that is possible to get this business has now been done --- this will be a big one if we make it. We are also under evaluation at Hillcrest Baptist Hospital, Waco, Texas, Deaconess Hospital, Oklahoma City, Oklahoma and Fort Worth Osteopathic Hospital, Fort Worth, Texas. Bill Hon reports approval for Clarion Gloves at Clovis Meml. Hospital, Clovis, New Mexico, and a conversion at St. John's Hospital, San Angelo, Texas. We seem to be doing pretty good with this product, but need additional customers to make it big.

Should we get the award from the State of Texas we'll have it made for awhile!

Ron Bailey picked up a $12,000 P.A.K. order at Deaconess Hospital - John Spicer got one for $3,600 at Coffeyville, Kansas, and with Jack Blake's help, we were able to re-new the Seton Hospital ADM Kit which was apparently lost.

We have quoted on a great number of ADM and PAK Kits, but even at close to cost we seem to be high. AHS and Will Ross beat us badly.

I don't have the Family Brand Print-out for July yet - but it looks like we should have improved in July over our June figures.

TRYLON

We were awarded a $5,000 instrument order at San Antonio Community Hospital, (American Medicorp, Inc.) and $4,000 at Parkland Hospital, Dallas, Texas, plus a number of smaller orders, which should show us over quota this month in TRYLON if shipments have been made.

A few ERF orders have come through and we've been promised this business from several accounts.

Improvement will be made in the Trylon business over the next few months.

EQUIPMENT

A few small orders - nothing near quota for the month. I'd like for us to get better on this line --- but ARGYLE - MONOJECT and CLARION need refinement prior to this product area.

In summary - not a disaster for July even though we are well below quota. Vacations - both our salesmen and key people in our accounts caused some slow down and July is not normally a banner month in this area anyway.

Hopefully, we will start moving back up the hill in August and for the balance of 1973.

Sincerely,

Chuck Beacham

Chuck Beacham

CB/jr

ALOE MEDICAL

Exhibit AJ

Departmental Communication Blank

TO Jack Blake FROM Herb Goff DATE 8/10/

SUBJECT

cc: Carl Hillier
Bill Nebel

Dear Jack:

Reference is made to our recent bid to the State of North Carolina on 960 cartons, 10/ct., MAR 2930-20. As OK'd by J. Blake, I quoted this at $25,296.00. Tomac was awarded the bid at $21,120.00. I am registering an official protest with the State of North Carolina. I will keep you advised.

Presbyterian Hospital, Charlotte, N. C. uses large quantities of our MAR2930-6. Up until this time Harry Wilson has sold at full price. We have now been forced to reduce price to .635¢. I personally know the P. A. in this hospital and he is playing fair with us.

A similar situation exists at Grace Hospital, Morganton, N. C. In this instance Harry was able to keep the price at .68¢.

Apparently, American does not have any pricing policy. They are going to give each account individual consideration. I have instructed all salesmen that we are not to lose any business to A.H.S. as a result of price cut.

Regards,

HJ

Herb

/wd

DEFENDANT'S EXHIBIT
Rec'd 4/13/76
AJ

ALOE MEDICAL 554 *Departmental Communication Blank*

Exhibit AK

TO Bill Nelsen - St. Louis FROM John Paurich - S.F. DATE 10/8/

SUBJECT VARIANCE REPORT - SEPTEMBER 1973

Dear Bill:

September billed sales were a disappointment, considering the total amount written through the month. Back-orders hurt, but October has started strong Although we are still critical on Argyle and surgeon's gloves, Clarion items seem to be catching up. My only real concern is the business lost because of the backorders. Thus far, it looks substantial, particularly with kits and gloves. I hope we will be able to recover on the good trend we started to establish.

Overall, however, the District has continued to show health with growth over 1972. September sales were nearly 20% over last year, with gains in most areas.

ARGYLE:

Argyle is viewed with both extreme elation, and bitter disappointment. The Closed Wound Unit, Aeroflow Catheter, and 12ga Medicuts has really created a positive sales attitude, only to be offset by backorders in established areas. I am certain, however, that the newer products will fill the void. Medicuts have been the real mystery. Our sales are sagging, but known losses are minimal. There is no obvious accounting as to why the dollars are not there. I have asked each salesman to breakdown each account, and check business. We may have lost business and not know it. You should take note, however, that Medicut sales are 34% ahead of last year through August, but September will have wiped out some of the gain. We sold 30,000 units in September, compared to 45M units in July. 37,000 units were sold in August. I have been keeping close watch on Medicuts and will write more detailed report in the near future. Initial response to the Aeroflow Catheter has been good, but not overwhelming. Reactions have been mixed, although most showings resulted in a trial order. Twelve (12) cases have been sold to date. I am disappointed in the nursing reaction to improved patient care. Their attitude has been apathetic, and non-committal. Most doctors were very impressed. It is to early to opinionate, so we will see.

The Closed Wound Set has been shelved temporarily until backorders are filled and stock has arrived. I am expecting big things from this unit.

General sales seemed good, but I cannot predict totals since backorders totaled over $14,000 in September. Sales do seem to be up, and growing.

As yet we have not experienced real trouble from AHS and their conductive tubings. We lost the Sacremento Medical Center ($25,000) to AHS. So far the hospital is happy with the tubing, and cannot justify going back to Argyle because of price. I cannot predict what losses, if any, we may have in the future.

DEFENDANT'S EXHIBIT Rec'd 4/13/76 AK

RECEIVED

OCT 10 1973

BILL NELSEN

John Bauriedel/S.F.

We are currently backordered on 26 self-manufactured Argyle items, and several vendor items. Foley Catheters are currently the most critical of the vendor items. We could lose sizeable business in catheters if we do not pressure suppliers.

CLARION:

Although we have improved, backorders are hurting with the general line also. Numerous items are on indefinite backorders, with gauzes, underpads, stockinettes and various paper items heading the list. Of course, vendor problems are the cause, but nonetheless, we'll lose business. We have sizeable business in stockinette for example, which is currently in jeopardy at Kaiser, Santa Clara Valley, and U.C. The dollar volume exceeds $30,000.00.

No need to mention surgeon's gloves.

Admission, and other patient kits are on the increase. We have had a high renewal rate, and many new kits have been initiated. I expect several new kit orders in October, primarily in PAK's/ Monthly sales have been increasing steadily, and I anticipate we should regain dollar losses increased in early '73 by mid '74.

The classics items have created some stir, although they have not really been shown that consistantly. Other new items have taken time away from them. Bruce Day has been given the responsibility of exposing the classics, and new sales should be slow for awhile. I feel, however, that we will, in time, gain some excellent new business with these items. Several kits, incorporating classic items, are currently in a stage of progress, and results should be in next week.

In general Clarion sales are showing healthy gains, and September should have been near 90% or better.

MONOJECT:

Although syringe-needle sales have leveled off somewhat, it appears that the sales have leveled at a near quota rate. Required price reductions seemed to be the primary reason for the bag. As I have noted, units sold have increased. Now that O'Connor is starting to order in full gear, and Merritt has converted, we will see sizeable monthly gains throughout the remainder of this year. I still feel we will attain our 1973 quota by years' end, providing we do not loose any major accounts.

Kit sales are continuing to improve, and I can forsee increased sales in the future.

TRYLON:

Instrument sales are continuing to grow with the addition of several new hospitals buying on large scale. Fresno County, Alta Bates, Hayward, and Sequoia have added to the increase substantially.

ERF instruments have added considerably to our increases. New conversions are being added regularly.

Stethoscopes are also adding to our growth. It is difficult at this point to determine overall sales, but all indications show substantial future business in this area.

Trylon sales should be at quota by year end, and I look forward to a good year in '74, providing we can retain Kaiser.

In general Bill, the month showed continued growth, in lieu of backorders, and other problems. Although we did not reach quota, had initial October billings been billed the last week, we would have. We had a great deal of dollar carry over. We are currently averaging $15,000/day as opposed to the needed $12,000.00.

John

UP/ar

ALOE MEDICAL

557

Exhibit AL

DISTRICT SALES MANAGER'S
Weekly Activity Report

TO: NATIONAL SALES MANAGER

cc: ASSISTANT NATIONAL SALES MANAGER

FROM Herb Goff

WEEK ENDING 10/12/73

MONDAY SALESMAN Self CITY Knoxville

Called on and sold Dr. Ann Avery five suites of Second Century furniture, approximately $6,000.00. Also, called on Fort Sanders Presbyterian Hospital r Admission Kits and Clarion underpads.

DEFENDANT'S EXHIBIT AL

TUESDAY SALESMAN Dave Dyar CITY

Barnwell County Hospital re lost Admission Kit. Unable to save. Lost due to foul-up on original quotation and subsequent delays in delivery. Called on Hampton County Hospital and Allendale County Hospital. Routine calls -- misse everyone that we wanted to see.

WEDNESDAY SALESMAN Dyar CITY Columbia, Camden, S. C.

Kershaw County Hospital recently evaluated CLARION P. A. K. P. A. was off but we were advised that our kit was selected. Baptist Hospital, Columbia, S. C. re Conductive Tubing. Business temporarily lost to A. H. S. Feel sure we wil regain. Aero-Flo sold for evaluation. Richland Mem. Hospital - detailed Clos Wound Suction, F.T.A. Gloves and arranged for a showing of Aero-Flo film week of 10-15-73. C. R. N. A. had seen in Chicago -- feel sure they will buy.

THURSDAY SALESMAN Dyar CITY Charleston, S. C.

U. S. Naval Hospital bought Aero-Flo for evaluation. O.R.S. detailed on Closed Wound Suction and 6 ft. non-conductive tubing. Medical University, S. C. re P.A.K. Bids being submitted this week. Looks favorable. Sold Aero-Flo for evaluation. Roper Hospital -- scheduled Aero-Flo film to be shown to group of ten M.D. Anestheologists on 10-16-73. Medicuts will be presented at this time Experiencing quality difficulties on Extension Tube Sets with stopcocks. Samp sent to Broy.

FRIDAY SALESMAN Self CITY Atlanta

Scheduled to meet with Wes Southern Friday morning. He had been in Miami and, apparently, was unable to return to Atlanta as I did not hear from him. Met with customer service representatives and Office Manager re a few inventory problems and re Atlanta bidding.

ATTACH ADDITIONAL PAGE FOR FURTHER COMMENTS

Green Copy - Retain

Total Salesmens Reported Sales $83,075 Week Ending 4/20

Salesmens Net Sales (Less Standing Orders) $83,075

DISTRICT STATUS REPORT

This is the first time that I have worked with Bill Clark since his accident. His physical condition seems to be good but he is still somewhat mixed up mentally. His memory is coming back as he faces his customers.

2. MONOJECT Conversions

3. ARGYLE Kits & Troy Conversions

American is starting to give us fits on their new conductive tubing as manufactured by Dave Sheridan. I have been unable to get any info as t their pricing but am told that it is "much cheaper". Ha[illegible] you been abl to get any price information?

4. CLARION

5. PIONEER Conversions

6. TRYLON

Ray NO

7. CITADEL/GRENADIER

4/27/73

8. Other Problems Encountered (excluding product problems)

In New Orleans next weeek with Kline & Russell.

ALOE MEDICAL
DIVISION OF SHERWOOD MEDICAL INDUSTRIES INC

TECH SALES

WEEKLY RECAP

Exhibit AQ

559

DATE: 2/1/75

WEEK ENDING 1/31/75

TO: ED SCHEIDERER

FROM: Mike Malloy

To Bryan Economidy

RECEIVED
FEB 7 1975
ED SCHEIDERER

DEFENDANT'S EXHIBIT
filed 4/13/76
AQ

Dear Ed,

I'm starting to hear more + more requests for an 18 Fr Cardio-Flo especially from anesthesiology. On some occasions I'm able to satisfy them by comparing the end hole on the Cardio-Flo and the eyes on the 18 Fr catheter and their similarity in size. What we need is a list of the exact size in area of the eyes on 18 Fr suction catheters and the same for Cardio-Flo. Then we can say in black and white what the difference is. Under separate cover I am sending Economidy a sample of the 18 Fr. Poetry and request he do this. Did appreciate your urging him to carry it thru. We've got a 225 Bed Hosp. who has evaluated and approved, waiting for anesthesia's O.K. in Venice, Fla. If I can get this info. to them we'll be set.

After receiving complaint from 500 Bed Manatee Mem. Hosp That our non-conductive 6', 3/16"

ALOE MEDICAL
DIVISION OF SHERWOOD MEDICAL INDUSTRIES INC

560

TECH SALES
WEEKLY RECAP

DATE:_____ WEEK ENDING_____

TO: ED SCHEIDERER

FROM:_____

did not fit their suction tips etc as well as the conducting 3/16" from which they just changed, & went to investigate. & found that the connector ends on our non-conducting tubing were so much smaller than the conducting that you couldn't even get a Poole etc. into the funnel end. We took in some 9/32" Non-conducting on Friday and that seems to solve the problem. Maybe something should be mentioned about not being able to substitute exactly from conducting to non-conducting of the same I.D.

Sincerely,

Mike

ALOE MEDICAL

Departmental Communication Blank

Exhibit AR 561

FROM Joe Sullivan - Chicago

TO Bill Nelsen

DATE 10.25.7

SUBJECT A.H.S. Conductive Tubing

DEFENDANT'S EXHIBIT Rec'd 4/13/76 AR LL

Dear Joe:

I can't seem to find the following information and I would like for you to update me on the situation at the University of Illinois. What I need to know, is what price did American Hospital Supply offer to the U. of I. and what price did we come back with on our tubing. Also, has there been any further activity in the district concerning this tubing.

Best regards,

Bill

RECEIVED NOV 1 1973 BILL NELSEN

WCN/jj

Bill

We got the business back at U of I at 45.00/ea which is the price they were paying from American the reason we got the business back had nothing to do with superiority of Argyle We got it because of Norb.

Tom in MC Williams lost one 300 bed hosp they prefered the connectors tight fit on the American tubing.

As I mentioned in my projected sales analysis for 1974 I am surprised we haven't heard more in Chi about tubing from America I am sure however we haven't seen the end of it. I will keep you posted as situations arise

Joe

ALOE MEDICAL

DEFENDANT'S EXHIBIT Rec'd 4/13/76 BA

DISTRICT MANAGER'S Weekly Activity Report

TO: NATIONAL SALES MANAGER
cc: ASSISTANT NATIONAL SALES MANAGER
FROM K Chandler
WEEK ENDING 4-11-75

Dave Smith

MONDAY SALESMAN Bob Pearson CITY Hartford, Conn.

H L Moore Drug Co. - Pioneer Dealer - Excellent relationship with new wife. Fine prospect for transport. They presently do about 15% with Surgical Blood Labs we are dealing with by-pass & blood cultures so that will be easy to promote. Sent out formally proposal with our 24/216 series.

TUESDAY SALESMAN Bob Pearson CITY Hartford, Conn.

Meeting at Memorial Hospital - Blood lab - Margot Lyons - good deal Surgical Cancer - M.I.S. presentation.
4-6:30 PM meeting with Roman Catholic, and Pioneer - we covered pioneer + Roman gloves in depth. Good guys + take

WEDNESDAY SALESMAN Dave Smith CITY Hartford, Conn.

Hartford Hospital - Roman glove and Sterile Cellbloc. PA will be installed (new file locks) good but pa. is dragging the feet.
St. Francis Hosp. John Pinault PA - physician manuals, and Tygon catheters

THURSDAY SALESMAN Randall Healy CITY Manchester, Conn.

Correspondence up-dated, Leads, all in order
Discussed prospects daily proposals or meeting with Roman.
Martin Medical Hosp. on PM re argyle Rate - prepared.

FRIDAY SALESMAN Dave CITY Boston -

Beth Israel Hospital - Boston Pioneer - They use Percy but may consider us.
Children Hospital Medical Center - Pioneer - Mike Brown working up a transport proposal re BD

ATTACH ADDITIONAL PAGE FOR FURTHER COMMENTS

BEST COPY AVAILABLE

Total Salesmens Reported Sales $_____

Salesmens Net Sales (Less Standing Orders) $_____

1. DISTRICT STATUS REPORT

Gentlemen:

(1) The boys in the field, getting psyched around by Dial and Pistol Cleaning with their hot selling line that just seemed good enough to sell such as Universal Hospital in Boston.

2. MONOJECT Conversions

It's unfortunate to see this business go by the boards and it seems especially difficult to sell (3) companies that are in the process in this field. Could we look into the manufacturing of that soft tray? Or should we send on our knowledge with the business to completion? We need it now.

(2) I still maintain that we need to take a BOLD approach to with Dial the competition. American Hosp. supply runs seminars wherein they publicly denounce (see file) Our product & the present and we should have a [illegible] showing can file re. Superior Sanitaire, Truth & Lies with the use of fabrications Feb. Stand up and lead the field. Non-contract Hot Showers-Federal should terminate this industry and not

3. ARGYLE Kits & Tray Conversions

follow on the wake of would-be product developers and catch up and suppliers! (3) We have superior efficiency the highest bacteriostatic standards, R+D, and quality products that people rely on. This should be emphasized and

6. TRYLON

carried theme through all printed advertising. We should have a unifying theme of improving efficiency + patient safety which can be woven throughout all literature and advertisements. What I'm saying is that many people are not

7. CITADEL/GRENADIER

aware of our identity which need be strengthened with good PR

(4) Suggestion: Let's get some marketing types into the field. This would be helpful to intelligently discuss the specific marketing program which is present E. Waffle, or Patient Care Proper feedback would enable us to make necessary changes to suit the demands of our customers and to effectively combat competition. My Reaction time would be

8. Other Problems Encountered (extluding product problems)

DEFENDANT'S EXHIBIT
Lee v 4/8/76
BF 2

EXHIBIT
BF

Dec. 25, 1962 D. S. SHERIDAN 3,070,132

NON-SPARKING MEDICO-SURGICAL TUBES

Filed April 6, 1960

Fig.1

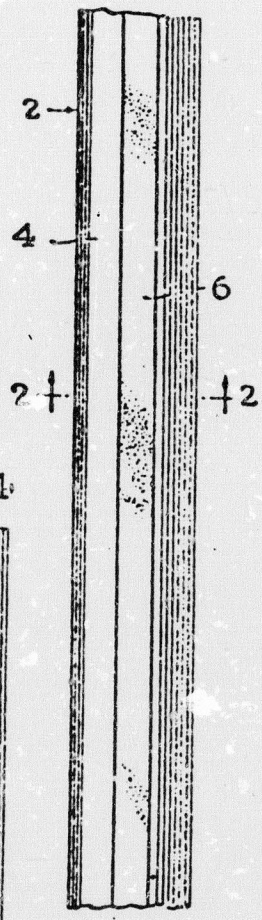


Fig.2

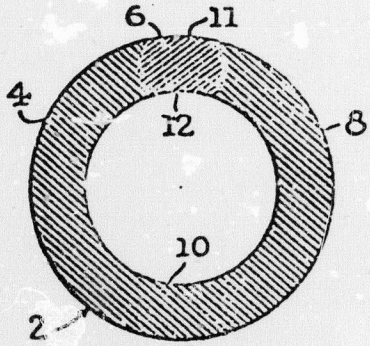


Fig.4

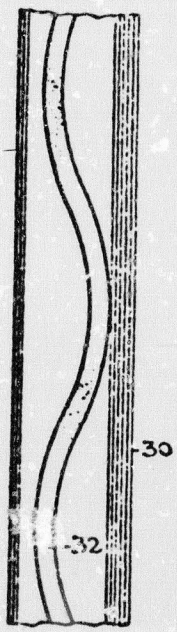
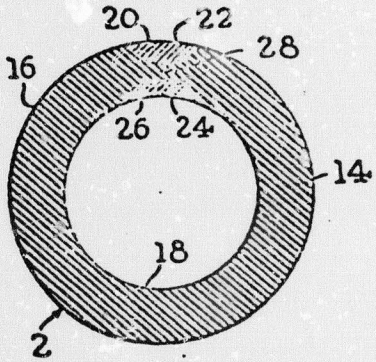


Fig.3



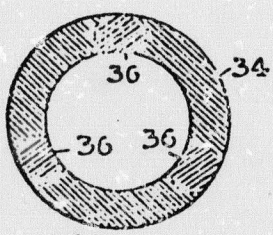


Fig.5

INVENTOR
David S. Sheridan

BY Kenyon, Pelham & Stewart

ATTORNEYS

United States Patent Office

3,070,132
Patented Dec. 25, 1962

3,070,132

NON-SPARKING MEDICO-SURGICAL TUBES

David S. Sheridan, P.O. Box 147, Argyle, N.Y.

Filed Apr. 6, 1960, Ser. No. 20,311
3 Claims. (Cl. 138—118)

This invention relates to non-sparking medico-surgical tubes, i.e., catheters, cannulae and similar tubular devices designed for use in surgical or medical treatments, which are free of the hazard of causing an electrostatic spark discharge to ignite flammable gas mixing in the area of use of the tubes.

Modern medical and surgical practices require a wide variety of medico surgical tubes, e.g., catheters, duodenal tubes, nasal cannulae, rectal tubes, oxygen connecting tubes, anesthesia administration tubes, and feeding tubes. These medico-surgical tubes are made from a variety of materials, although rubber and vinyl plastics account for the large bulk of medico-surgical tubes which are made and sold today. In order to prevent cross-infections and to eliminate the cost of sterilizing re-used tubes, the trend today in medical practice is to employ single-use, disposable catheters and other medico-surgical tubes. Because of the economy of production, most of such disposable tubes are formed by extrusion methods from vinyl plastic material.

The vinyl plastic material used to form extruded medico-surgical tubes is compounded from dielectric polymers. These polymers, whether in a plasticized or unplasticized state, when brought in frictional contact with other bodies, e.g., fabrics of cotton, nylon or the like, acquire a strong electrostatic charge.

The great hazard associated with possible ignition of flammable gases by electrostatic spark discharge in anesthetizing locations in hospitals has long been known and appreciated. Both hospital personnel and insurance companies are vitally interested, and a number of political subdivisions now have statutes designed to eliminate the hazard associated with electrostatic spark discharge in connection with medical and surgical operations. The sparking hazard is mainly associated with anesthetizing procedures which employ combustible anesthetic agents, including cyclopropane, divinyl ether, ethyl chloride, ethyl ether and ethylene. Hazardous anesthetizing locations are not limited to operating rooms of hospitals, but may include any area of a hospital in which it is intended to administer to a patient any combustible anesthetic agent in the course of examination or treatment. This includes, in addition to operating rooms, such other anesthetizing locations as delivery rooms, anesthetic rooms, corridors, utility rooms and other areas if used for induction of anesthesia with combustible anesthetic agents.

It has become a recognized fact that the electrostatic sparking hazard may be reduced by the use of suitable grounding devices and the use of electrically conductive casters, sheeting, floor coverings, mats and other equipment. Safe practices for employing electrically conductive items in medical and surgical practices have been outlined by the National Fire Protection Association and are described in N.F.P.A. Standard No. 56 entitled, "Recommended Safe Practice for Hospital Operating Rooms."

A principal object of this invention is the provision of non-sparking, medico-surgical tubes made of flexible, dielectric plastic material. Further objects include:

(1) The provision of medico-surgical tubes extruded from dielectric vinyl plastic which may be used in proper combination with grounding and other conductive devices at anesthetizing locations to mitigate electrostatic sparking hazards.

(2) The provision of extruded plastic medico-surgical tubes which are capable of being connected to ground to prevent any electrostatic charge from accumulating on the tube during its use in medical or surgical operations.

(3) The provision of medico-surgical tubes made of vinyl plastic, which have an apparent exterior and interior surface resistivity of not over 1 megohm-centimeters.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

These objects are accomplished according to the present invention by forming medico-surgical tubes, by extrusion, from flexible, dielectric plastic material and including as an integral part of the formed tube a stripe of flexible electrically conductive, plastic material extending longitudinally along the exterior wall of the tube, and also a stripe of flexible, electrically conductive, plastic material extending longitudinally along the interior wall of the tube, the stripes being integral with the tubular member and substantially contiguous with the walls so that the medico-surgical tube has substantially smooth exterior and interior walls. The interior and exterior stripes of electrically conductive plastic material may be separate from one another or they may be of such depth that they form a single fused longitudinally extending section in the medico-surgical tube. In any event, the electrically conductive integral stripes so formed in the plastic medico-surgical tube may be connected to ground, whereby the tube is prevented from accumulating any electrostatic charge during its use at an anesthetizing location or any other place where it may be employed in medical or surgical operations.

The success of the present invention is due in part to the discovery that it is not necessary for a tubing made of flexible plastic material to be electrically conductive throughout its entire interior and exterior surfaces in order to prevent an electrostatic charge from accumulating on the tube sufficient to cause a sparking discharge. It involves the further discovery that inclusion of an electrically conductive element such as a strand of wire or the like, on the other hand, within the body of the tube (see, for example, U.S. 2,268,321) is not capable of preventing electrostatic charge from accumulating on a medico-surgical tube. An additional discovery is that obtaining satisfactory nonsparking qualities in a medico-surgical tube requires a stripe of electrically conductive integral plastic, not only on the exterior surface of the tube, but on the interior as well.

A more complete understanding of the new non-sparking medico-surgical tubes of this invention and their method of production can be had by reference to the accompanying drawing, in which:

FIG. 1 is a fragmentary plan view of a medico-surgical tube made in accordance with the present invention;

FIG. 2 is an enlarged cross-sectional view of the medico-surgical tube of FIG. 1, taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged cross-sectional view of a modified form of non-sparking medico-surgical tube made in accordance with this invention.

FIG. 4 is a fragmentary plan view of a modified form of medico-surgical tubes of this invention;

FIG. 5 is an enlarged cross-sectional view of yet another modified form of the new tubes.

Referring in detail to the drawings, the medico-surgical

tube 2 basically consists of a tubular member 4 and an electrically conductive, longitudinal portion 6.

Tubular member 4 has a substantially smooth exterior wall 8 and a substantially smooth interior wall 10, these being substantially contiguous with the exterior surface 11 and interior surface 12 of the electrically conductive portion 6 so that the entire tube 2 presents a smooth exterior and smooth bore.

The electrically conductive portion 6 runs longitudinally along the entire length of the tube 4 and is formed of flexible plastic material which is cohesive with the plastic material of the tube 4. The main body of the tube 4 may be made from any suitable flexible water-proof plastic material, and although vinyl chloride homopolymers or copolymers with other vinyl esters, such as vinyl acetate, are especially useful, other usable materials include: pliable or flexible forms of nylon, polyester plastics, polyethylene, vinylidene chloride polymers, cellulose esters, acrylic polymers and the like.

Electrically conductive longitudinal portion 6 is preferably made from the same plastic base material as the remainder of the tubular body 4, although it is possible to form the tubular member 4 of a composition based on one plastic material and the conductive portion 6 from a different plastic material, so long as the two separate plastic materials are cohesive to one another. In any event, if the same base plastic is used to produce the tubular member 4 and longitudinal portion 6, or a different, cohesive plastic is used to form the longitudinal portion 6, an integral structure results which is fluid-tight and which can be subjected to rigorous conditions of use, sterilization or other abuse which it may encounter in medical or surgical operations.

Generally, the plastic material of which tubular member 4 is composed will be unpigmented so that all of the tube, except the longitudinal portion 6, will be transparent. This makes it possible to look through the medico-surgical tube and to view the interior to determine if there is any foreign matter or obstruction within the bore of the tube. If desired, dyes can be incorporated in the plastic material to give the tube a distinct color, thus marking the tube for special uses or other purposes, e.g., oxygen connecting tubes and oxygen nasal cannulae are colored a light green in accordance with established practice in the trade. Pigments may be included in the plastic material comprising tubular member 4 to create an opaque tube, e.g., inclusion of titanium dioxide pigment to produce an opaque white composition which is used in certain forms of Levin style duodenal tubes.

The flexible plastic material used to form the longitudinal portion 6 of the new non-sparking tubes is rendered electrically conductive by compounding the plastic material with a substantial proportion, preferably between about 5 and 40% and especially between about 10 and 30% of a very finely powdered electrically conductive solid material. Finely subdivided metals such as copper, aluminum or silver are examples of electrically conductive materials which may be employed to form electrically conductive plastic material for the longitudinal portion 6 of the non-sparking tubes. However, it is preferable to form the plastic material for the portion 6 of the new tubes using powdered, electrically conductive carbon. Such forms of carbon are standard items of commerce. The use of carbon as the electrically conductive component of the plastic composition is preferred over the use of powdered metals, because of its lack of deteriorating effect upon the plastic matrix and because of its relative inertness to body fluids or other materials with which it comes in contact during normal use of the medico-surgical tube.

The modified form of non-sparking tube as shown in FIG. 3 comprises a tubular member 14 having a smooth outer surface 16 and smooth inner surface 18. A stripe 20 of flexible electrically conductive plastic material is embedded in the exterior surface 16 and has its exterior surface 22 contiguous with the surface 16 of the tubular member 14, so that the entire outer surface of the tube is completely smooth. A second stripe 24 of flexible electrically conductive plastic material is embedded in the interior surface 18 of the tube member 14, also having a surface 25 which is contiguous with the interior surface 18.

Since the inclusion of a substantial amount of electrically conductive powder in the plastic material causes some reduction in tensile strength of the plastic material, the form of non-sparking medico-surgical tube shown in FIG. 3 may have a slight advantage in applications where tensile strength or bursting strength of the tube are of importance, since the tube 2 includes an unfilled web portion 26 which runs longitudinally of the tube between the electrically conductive stripes 20 and 24. In the modified form of tube 30 shown in FIG. 4, the longitudinally extending electrically conductive tube portion 32, is formed as a sinusoidal line rather than a straight line as in FIG. 1. Spiral configurations for the conductive line may also be used.

In the modification shown in FIG. 5, the tube 34 is provided with a plurality of integral electrically conductive portions 36.

The new non-sparking medico-surgical tubes are made by extrusion using a multi-orifice tubular extrusion die. Such multi-orifice extrusion equipment is known and is disclosed, for example, in U.S. 2,857,915. The main body of the tube, i.e., tubular member 4 or 14, is extruded through the major orifice of the extrusion die, while the longitudinal conducting portions, 6, 20 or 24 are extruded simultaneously with the main body portion through the minor orifice or orifices of the extrusion die. In the case of the form of tubing shown in FIG. 2, a bi-orifice tubular extrusion die is used, whereas to produce the modified form of tube shown in FIG. 3, a tri-orifice tubular extrusion die is used.

The non-sparking tubes of this invention may be used to form a large variety of medico-surgical tubular devices. These may include nasal cannulae such as disclosed in U.S. 2,693,800, 2,735,432 and applicant's copending application S.N. 752,050, filed July 30, 1958. Also, catheters of the Levin style, X-ray catheters of the type disclosed in U.S. Patents 2,212,334 or 2,857,915, oxygen connecting tubes, rectal tubes, e.g., improved rectal tubes of the type disclosed in applicant's copending application S.N. 746,135, filed July 2, 1958, and medico-surgical tubes of the type having improved integral connector ends such as disclosed in applicant's copending application S.N. 746,134, filed July 2, 1958. The medico-surgical tubes of this invention may be also provided with one or more tapered sections as disclosed in applicant's copending application S.N. 746,175, filed July 2, 1958.

The new tubes may be made and sold in very long continuous lengths of uniform O.D. and I.D. or with tapered sections therein. More commonly, however, the tubing as it is withdrawn from the extrusion die, will be cut into short lengths required for the particular medico-surgical device ultimately involving the tube. In the case of catheters, cannulae and the like, eyes or openings in the required number can be drilled, punched or melted into the tubing to form the necessary inlet openings in the distal ends of the tube.

The non-sparking tubes of this invention will withstand substantially all conditions of use and adverse treatment as any other plastic medico-surgical tubes. They may be manufactured to professional specifications and may be produced in various degrees of flexibility by varying the formulations of the plastic material from which the tubes are extruded. They may be used interchangeably at non-hazardous locations with similar medico-surgical tubes which do not incorporate the non-sparking feature of the tubes of this invention, and they will satisfactorily perform all the functions for which such tubes are known

to be useful. Since they may be electrically grounded to prevent electrostatic charge from accumulating on the tube during its use, they substantially eliminate the electrostatic spark discharge hazard connected with the use of prior known plastic catheters or other surgical tubes which do not have their non-sparking properties. The conductive line in the new tubes may also be used to conduct electrical current from an applied current source for special purposes, e.g., to provide heating of the tube.

I claim:

1. A non-sparking medico-surgical tube comprising a tubular member having substantially smooth exterior and interior walls, said member being formed of flexible, dielectric, water-proof, plastic material, a continuous stripe of flexible electrically conductive, water-proof, plastic material extending longitudinally along said exterior wall, a stripe of flexible, electrically conductive, water-proof plastic material extending longitudinally along said interior wall, said stripes being integral with said tubular member and substantially contiguous with said walls, said tube being capable of being connected through said stripes to ground to prevent any substantial electrostatic charge from accumulating on the tube during its use.

2. A non-sparking medico-surgical tube which may be used in anesthetizing locations in hospitals in conformity with safe operating practice for such locations, which consists of a non-fibrous tube of flexible, water-proof dielectric plastic material, a continuous longitudinally extending electrically conductive plastic portion formed integrally with the tube of flexible, electrically conductive, water-proof plastic material, said longitudinal portion having exterior and interior surfaces contiguous with the exterior and interior surfaces of the remainder of the tube, whereby the tube has substantially smooth inner and outer surfaces.

3. Non-sparking medico-surgical tubes as claimed in claim 2, wherein said tubes, exclusive of said longitudinal electrically conductive portion, are transparent to visible light.

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Exhibit BG

568

United States Patent

[11] 3,580,983

[72] Inventor Isaac S. Jackson
Greenwich, N.Y.

[21] Appl. No. 881,750
[22] Filed Dec. 3, 1969
[45] Patented May 25, 1971
[73] Assignee National Catheter Corp.
Argyle, N.Y.

[54] CONDUCTIVE LINE TUBE
10 Claims, 6 Drawing Figs.

[52] U.S. Cl. 174/47, 128/2.05R, 128/348, 317/2R, 339/16R
[51] Int. Cl. F16l 11/12, H05f 3/02
[50] Field of Search ..... 174/15 C, 47, 70 R, 113 AS, 117 AS, 115; 138/103, 118, 138; 339/15, 16 R; 340/320; 317/2 R; 128/2.05 D, 2.05 R, 348, 349 R, 350 R

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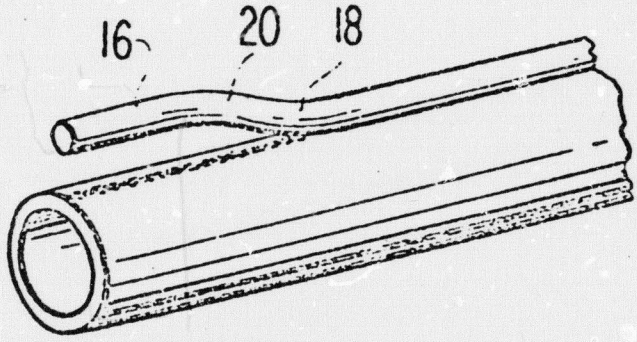
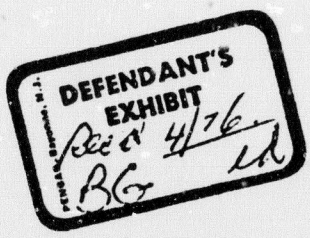
3,465,111	9/1969	Breslin	174/47X

Primary Examiner—Laramie E. Askin
Attorney—Kemon, Palmer and Estabrook

ABSTRACT: The fabrication of conductive line tubing or electrically conductive medicosurgical tubes by extruding from a mass of flexible plastic material an elongated tube contemporaneous with the extrusion of an elongated electrically conductive plastic filament that is secured to said tube in superimposed relationship piggyback arrangement. The plastic material used to form the conductive line tubes is compounded from dielectric polymers while the filament is formed from a flexible electrically conductive plastic material. The extrusion of the tube and filament is continuous with the filament being secured to the tube subsequent to its withdrawal from an extrusion die.





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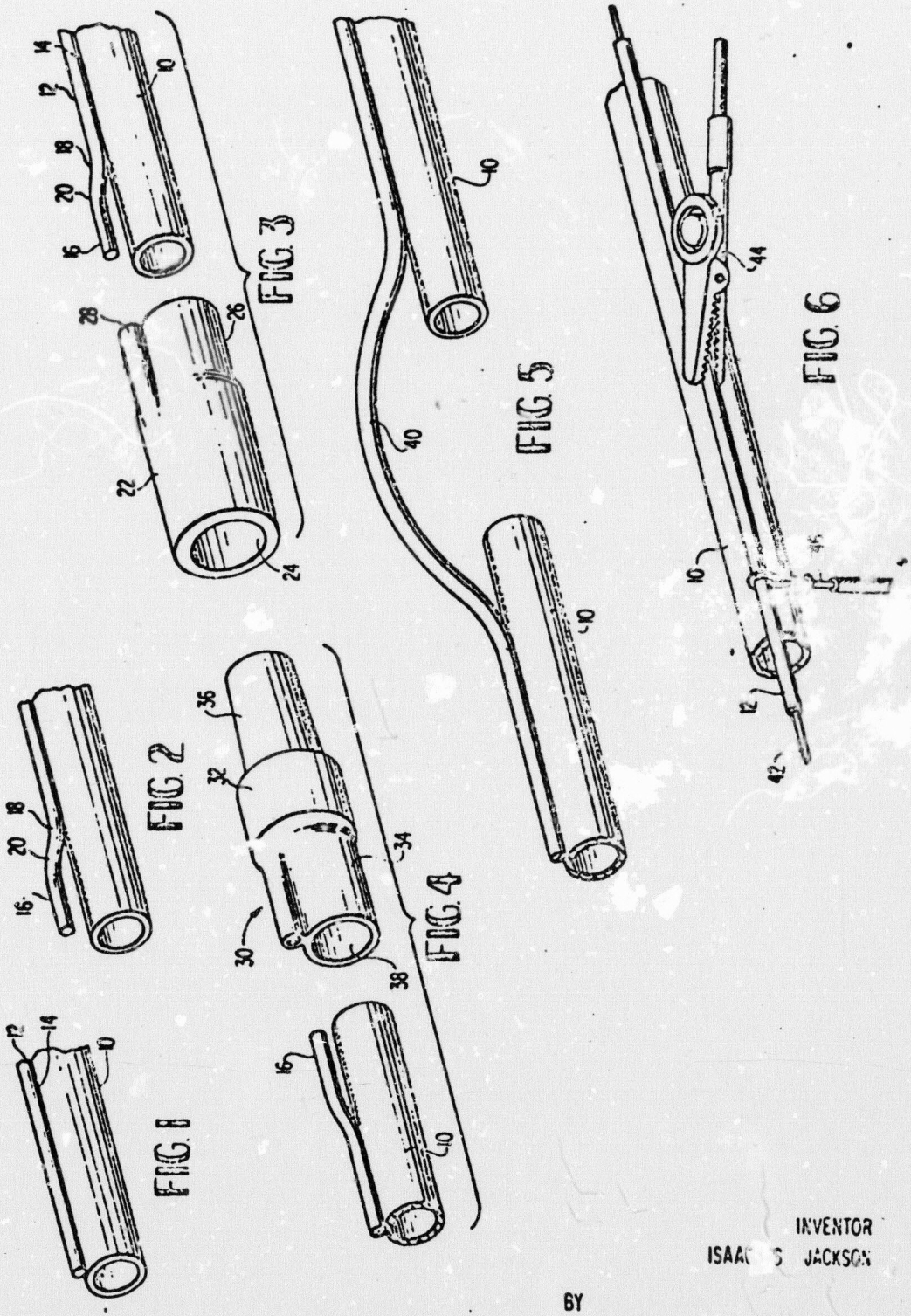

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CONDUCTIVE LINE TUBE

BACKGROUND OF THE INVENTION

The present invention pertains broadly to flexible pipes or tubular conduits and more specifically to conductive line tubes that are quite often referred to as nonsparking medicosurgical tubes, e.g., catheters, nasal cannulae, suction connecting tubes, oxygen connecting tubes, anesthesia administration tubes and feeding tubes. While these tubes may be formed from a variety of materials, the greater portion are fabricated from either rubber or vinyl plastics with present day practices being to use such tubes only once and then dispose of them. The tubes are usually fabricated from a vinyl plastic material that is compounded from dielectric polymers which are susceptible of acquiring an electrostatic charge upon frictionally contacting other bodies or surfaces such as textile elements. These conductive line or medicosurgical tubes are used extensively in surgical and medical treatments that are often carried on in areas such as operating rooms wherein a combustible anesthetic agent might readily be present. Thus, it is essential to eliminate the possibility of creating or causing an electrostatic spark discharge in such areas. Suitable grounding devices, such as sheeting, floor coverings, mats and other equipment may readily be used in these areas to reduce the sparking hazard.

It is well known from the teachings of the prior art that flexible fluid conduits, such as a hose composed of fiber or plastic, may have connected thereto a flexible metallic static wire. The U.S. Pat. No. 2,811,674 to Smith of Oct. 29, 1957, is illustrative of such a conduit for transferring flammable fluids which tend to generate static electric charges that could collect and cause a spark. The static wire is utilized to ground any charges that might collect on the hose or parts thereof, such as the nozzle. The prior art Pat. to Flynn U.S. Pat. No. 2,268,521 of Dec. 30, 1941, pertains to catheters or similar devices, wherein a strengthening or reinforcing filament of nylon or the like is embedded within the wall of the tubular member which is formed from a plasticlike material. In U.S. Pat. No. 3,070,132 to Sheridan dated Dec. 25, 1962, there is disclosed a tubular device formed from plastic material which has incorporated therein as an integral part thereof, a stripe or stripes of flexible electrically conductive plastic material. These stripes of plastic material may be connected to suitable grounding devices so that the tubular device is prevented from accumulating any electrostatic charge during its use in an area wherein an ignitable flammable gas might be present during a medical or surgical treatment.

SUMMARY OF THE INVENTION

The present invention is directed to the concept of securing to the surface of an extruded plastic tube an electrically conductive plastic filament that may be grounded so as to prevent the tube from accumulating any electrostatic charge. The plastic tube and the plastic filament are preferably extruded in separate and continuous operations with the plastic filament being subsequently affixed to the plastic tube. The plastic filament is secured to the peripheral surface of the plastic tube by a continuous welding operation. While not absolutely essential, it has been found highly desirable to weld the plastic filament to the plastic tube upon the completion of the extrusion operations so that there is one long continuous weld extending the entire length of the tube. The plastic filament may be readily separated from a section or area of the plastic tube to permit the removal of said tube section and the insertion of a suitable fitting or device into the tube while still being able to maintain electrical continuity from end to end of the tube. The positioning or mounting of the plastic filament upon the outer surface of the tube readily facilitates the attachment of static bonding clamps to the filament for grounding any electrostatic charge that might tend to accumulate. In lieu of such clamps, a suitable wire could be inserted between the filament and tube and then twisted about the filament to produce an effective ground for any charges that might be upon the tube.

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BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a fragmentary portion of a conductive line tubing made in accordance with the present invention;

FIG. 2 is a perspective view of the tube of FIG. 1 showing a segment of the filament portion separated from the tube;

FIG. 3 is an exploded perspective view showing the tube of FIG. 2 and an end fitting for said tube;

FIG. 4 is an exploded perspective view of another end fitting for the tube of FIG. 2;

FIG. 5 is a perspective view of another form of conductive line tubing embodying the present invention; and

FIG. 6 is a perspective view of still a further variation of a conductive line tubing embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, there is shown in FIGS. 1 and 2 a conductive line tube or tubing unit consisting of a tubular member 10 and an electrically conductive filament 12. The tube or tubular member 10 is made by extruding a plastic material through a suitable die of any well-known type so as to produce a elongated tube of constant and uniform thickness and diameter which has a smooth and uninterrupted inner surface or bore and a smooth outer or exterior surface. The filament member 12 is likewise formed by extruding a plastic material through an extrusion die of any well-known type, and said filament member is of diameter that is considerably less than the diameter of the tube 10.

The tube 10 may be formed from any suitable flexible waterproof plastic material, such as vinyl chloride, homopolymers or copolymers with other vinyl esters, such as vinyl acetate. In lieu of the foregoing, the tube may be formed from flexible or pliable forms of nylon, polyurethane, polyester plastics, polyethylene, vinylidene chloride polymers, cellulose esters, acrylic polymers and the like. The plastic material utilized in forming the tube 10 is preferably free of dyes and pigments so as to produce a clear transparent tube which permits a visual inspection of the tube throughout its length to ascertain if there is an obstruction or foreign matter within the bore of the tube. While the aforementioned type of tube is preferable, various dyes may be incorporated in the plastic material so as to produce a tube of a distinctive color that could be employed for a particular purpose or special treatment.

The electrically conductive filament member 12 is preferably made from the same plastic base material as tubular member 10, but is rendered electrically conductive by compounding the plastic material with a very finely powdered electrically conductive solid material. The conductive solid material may range anywhere from 5 percent to 40 percent of the plastic material and may be powdered carbon or a metal, such as, copper, silver or aluminum. The electrically conductive filament member 12 is preferably extruded through an extrusion dye contemporaneous with and adjacent to the extrusion of the tube 10 so that the filament member may then be secured upon the exterior surface of the tube 10. As shown in FIGS. 1 and 2, the filament member 12 is secured to the tube 10 by a fusion or welding 14 of the two members in a continuous manner and at the time of extruding the two members through their respective dies. This manner or means of securing the filament member to the tube 10 readily permits the filament member 12 to be removed or torn away from the tube at any point throughout the length of the tube. Thus, an end portion 16 of the filament member 12 may be torn away from an end portion of the tube 10 and initially bent outwardly as in 18, in FIG. 2 and then bent back upon itself as at 20 in FIG. 2 whereby said end portion of the filament member will be arranged in spaced parallel relation to the end portion of the tube.

As shown in FIG. 3 the end portion of the tube 10 and filament member 12 of FIG. 2 are adapted to be connected to a funnel-type fitting or housing 22. The housing 22 is a molded fitting formed from a suitable conductive plastic which may be

of the same material employed in forming the filament member 12. The housing or fitting 22 is formed with a smooth inner passage or bore 24 and a smooth exterior surface that terminates in a reduced end portion 26 which is provided on its external surface with a socket 28. The bore 24 at the reduced end portion 26 of the fitting 22 is of a diameter slightly greater than the external diameter of the tube 10 while the internal diameter of the socket 28 is slightly larger than the diameter of the filament member 12. Thus, the fitting or housing 22 is positioned upon the end of the tube 10 with the end portion 16 of the filament 12 being inserted into the socket 28, and said fitting is then secured to the end of the tube 10 and filament member 12 by fusion or cementing.

There is disclosed in FIG. 4 an elongated end fitting 30 for the tube 10 and filament member 12 that is similar to the fitting 22 shown in FIG. 3 with the exception that the fitting shown in FIG. 4 is of the plug or connector type. The plug 30, like the housing 22, is a molded fitting formed from a suitable conductive plastic material with an enlarged boss 32 in the central portion thereof. The plug fitting 30 has formed on one side of the boss 32 an end portion 34 that is of a configuration complementary to the ends of the tube 10 and filament member 12 which are secured to the fitting by welding in the same manner that fitting 22 is secured to the tube 10. The fitting 30 is formed on the other side of the boss 32 with a tapered plug portion 36 which together with the boss 32 and end portion 34 have a smooth, continuous and uninterrupted inner passageway or bore 38.

A tube 10 and filament member 12 which have a fitting secured to each end, such as fitting 22 to one end of the tube and fitting 30 to the other end of the tube, constitute a unit that is electrically conductive from one end to the other. Such a unit may readily be grounded so as to prevent the tube 10 from accumulating any electrostatic charge while being used in a medical or surgical treatment that might be carried on in an area wherein a combustible agent might be present.

In FIG. 5 there is shown a tube 10 which has had a portion or section removed therefrom to permit the mounting or insertion in said tube of a suitable fitting or device, not shown. Prior to removing the section of the tube 10, a portion 40 of the filament member 12 has been separated from the tube by tearing or breaking the weld 14 which permits the retention of the continuity of the electrical conductivity from one end of the tube to the other.

The tubular member 10 shown in FIG. 6 has a filament member 12 secured thereto by a continuous weld with the filament member having a wire core member 42. The use of a wire 42 in the center of the filament member would still permit it to retain its flexibility, but at the same time, it would function as an added conductor which would tend to lower the resistance of the filament member 12. There is also shown in FIG. 6, the use of conventional static bonding clamps 44 for readily engaging the filament 12 in order to ground any electrostatic charge that might accumulate on the tube 10. Another form of grounding any electrostatic charge that had accumulated on the tube 10 is shown in FIG. 6, wherein, one end of a wire 46 is first inserted between the tube 10 and filament member 12, and then is twisted about the filament member 12 to effect a tight clamping connection. The clamps 44 as well as the grounding wire 46 are readily susceptible of use with the filament member 12 and tube 10 illustrated in FIGS. 1 through 5 due to the mounting of the filament member upon the outer surface of the tube 10. The positioning of the filament member upon the outer surface of the tube, as shown in FIGS. 1 through 6, not only permits the positive grounding of the tube 10 by securely engaging the filament member 12, but permits the tube 10 to be formed with walls of a uniform thickness throughout, wherein, the bursting strength and tensile strength of said tube are of importance.

Although the foregoing description is necessarily of a detailed character in order that the invention may be completely set forth, it is to be understood that the specific terminology is not intended to be restrictive or confining, and that various rearrangements of parts and modifications of detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

What I claim:

1. A conductive line tubing comprising an elongated tubular member formed of flexible, dielectric, waterproof plastic material, an elongated filament member secured to the exterior surface of said tubular member in superimposed relationship therewith, said filament member being formed of flexible, electrically conductive, waterproof plastic material, said filament member being capable of being connected to ground to prevent the accumulation upon said tubular member of any electrostatic charge.

2. A conductive line tubing as set forth in claim 1 wherein said filament member is secured throughout its length to said tubular member by welding.

3. A conductive line tubing as set forth in claim 1 wherein each end of said tubular member and filament member is connected to a fitting formed of electrically conductive plastic material.

5. A conductive line tubing as set forth in claim 1 wherein static bonding clamps are connected to said filament member for grounding said tubular member.

6. A conductive line tubing as set forth in claim 1 wherein said filament member is formed with a wire core member.

7. A conductive line tubing as set forth in claim 1 wherein said filament member is welded to the exterior surface of said tubular member from one end to the other whereby a portion of said filament member may be separated from said tubular member to permit the removal of a section of said tubular member while still maintaining electrical conductivity of said tubular member.

4. A conductive line tubing as set forth in claim 3 wherein each fitting is formed with an end having a configuration complementary to the end of the tubular member with the filament member mounted thereon.

8. Plastic tubing that is capable of being electrically connected to ground to prevent accumulation thereon of an electrostatic charge comprising:

a. an elongated tube formed of flexible, dielectric, waterproof plastic material, said member having a substantially uniform continuous exterior wall and,

b. an elongated filament having a diameter substantially less than the diameter of said tube formed of flexible, electrically conductive, waterproof plastic material,

c. said filament being completely external of said tube and secured to said tube only along a line of tangential contact between the exterior wall of the filament and the exterior wall of the tube whereby said filament may be separated from the tube along any selected length by pulling the filament away from the tube without any substantial disturbance to said exterior wall of the tube.

9. Plastic tubing of claim 8 wherein said filament is of solid cross section throughout its length and contains 5 to 40 percent by weight of powdered electrically conductive material selected from the group consisting of carbon, copper, silver and aluminum.

10. Plastic tubing of claim 8 wherein said filament consists of a wire core encased with plastic material.

PHYSICAL EXHIBIT

PHYSICAL EXHIBIT

Exhibit BR

United States Patent [19]

Berliner et al.

[11] **3,914,002**

[45] **Oct. 21, 1975**

[54] **CONDUCTIVE TUBING AND METHOD OF MAKING SAME**

[75] Inventors: **Mayer Berliner**, Lake Luzerne, **James G. Stewart**, Amsterdam, both of N.Y.

[73] Assignee: **Sherwood Medical Industries Inc.**, St. Louis, Mo.

[22] Filed: Apr. 17, 1974

[21] Appl. No.: 461,563

[52] U.S. Cl. ..... 339/16 R; 128/348, 174/47, 174/74 R, 264/105; 264/131; 317/2 J, 425/326 R

[51] Int. Cl.[2] F16L 11/12; H05F 3/02, A61M 25/00; B29D 23/04

[58] Field of Search ..... 174/47, 74 R, 78, 84 S, 128/2.05 R, 2.05 D, 348, 349 R, 350 R, 138/103, 109, 118, 120, 264/95, 104, 105, 131, 150, 173; 317/2 R, 2 J, 339/15, 16 R; 425/326 R

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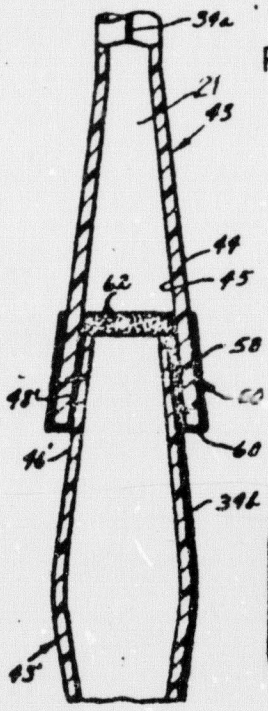
Primary Examiner—Laramie E. Askin

Attorney, Agent, or Firm—Stanley N. Garber; William R. O'Meara

[57] ABSTRACT

A conductive plastic tube for preventing the accumulation of electrostatic charges having a conductive plastic stripe to be grounded and an integral tube connector provided with a conductive plastic coating covering the open end including external and internal walls of the connector and a portion of the stripe. The connector is adapted to connect the tube to another member in fluid tight relation and to electrically connect the conductive stripe to a conductive element of the other member. The tubing is extruded with a conductive stripe and spaced integral conical portions serving as end connectors when severed. The connector is dipped in a solvent dispersion of conductive plastic and thereafter removed and allowed to dry to produce a conductive plastic coating on the connector end.

13 Claims, 7 Drawing Figures



PATENT RESEARCH SERVICE

KENT, WASHINGTON 98031

DEFENDANT'S EXHIBIT

Rec'd 4/2/76

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U.S. Patent Oct. 21, 1975 3,914,002

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FIG. 1

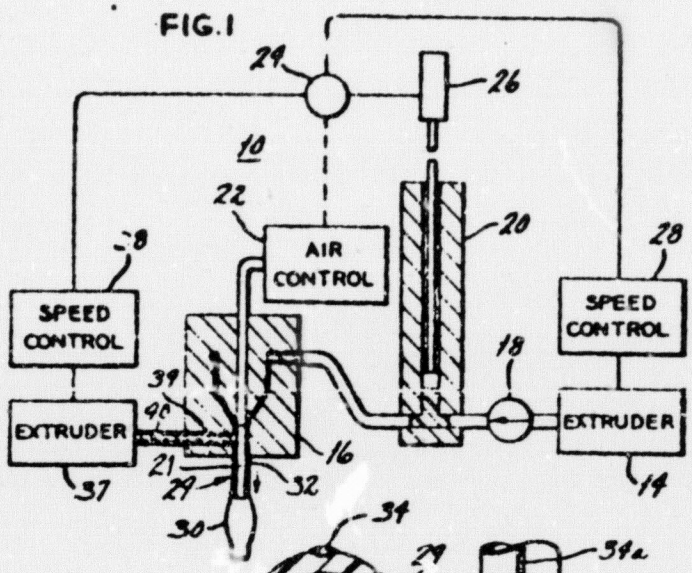


FIG. 2

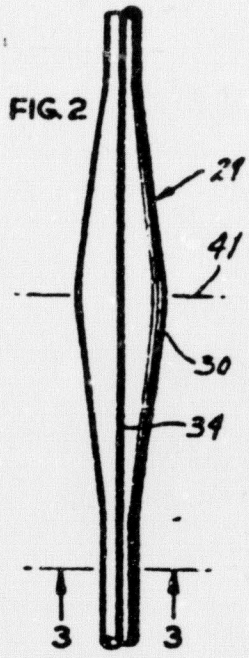
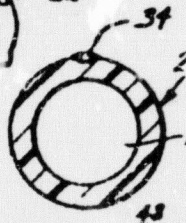


FIG. 3



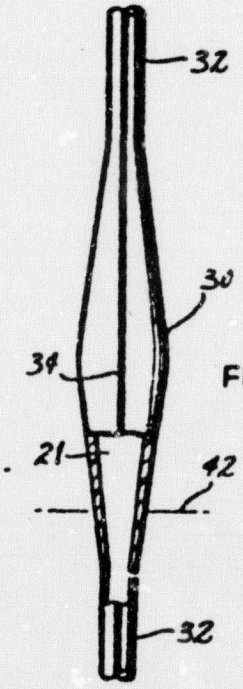


FIG. 5

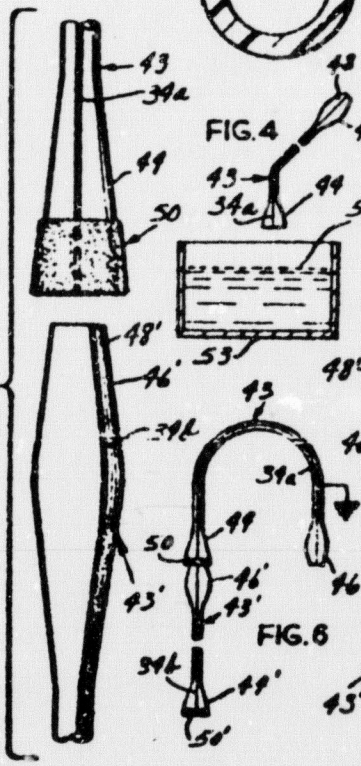


FIG. 4

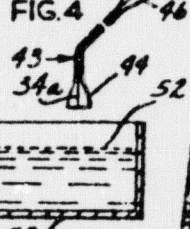
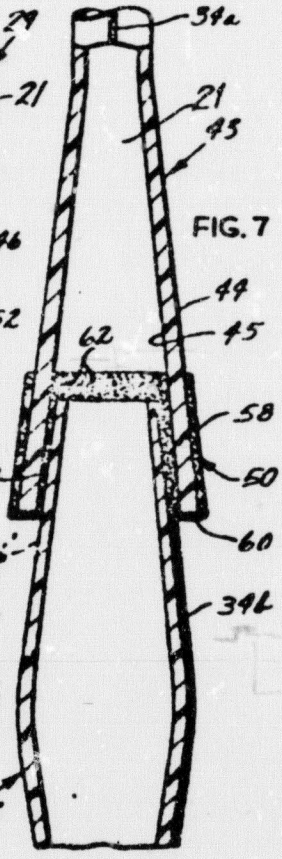


FIG. 6

FIG. 7



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CONDUCTIVE TUBING AND METHOD OF MAKING SAME

BACKGROUND OF THE INVENTION

This invention relates to plastic tubing having a conductive stripe thereon for preventing the accumulation of electrostatic charges and more particularly to such plastic tubing with connector means for effecting fluid and electrical connection between the tubing and another member, and to a method of making tubing of this type.

Plastic tubing has been made with conductive plastic stripes or filaments along its length for grounding the tubing to prevent build-up of electrostatic charges and sparking. Such tubing is utilized where combustible atmospheric conditions may occur. For example, medical and surgical tubes such as catheters, suction tubes, oxygen and anesthesia administrating tubes and the like, are used in hospitals where combustible atmospheric conditions often occur. U.S. Pat Nos. 3,070,132 and 3,580,983, for example, disclose plastic tubing having longitudinally extending conductive plastic stripes or filaments for preventing electrostatic spark discharges.

There have been certain undesirable features associated with the use of such conductive tubes. In some cases a special and relatively expensive connector or component of metal or metal and plastic has been required to connect a tube in fluid tight connection and in electrical connection with another device, such as another conductive tube. In the above-mentioned U.S. Pat. No. 3,580,983, special molded fittings which may be made of the same material as the conductive plastic stripe, are secured to the end of a tube by fusion or cementing. Separate connectors or fittings not only increase the amount of material and other manufacturing costs, but increase the number of points of possible fluid leaks, as well as increase the number of electrical connections required. In some cases, tubing was provided with longitudinally conductive stripes or filaments having a thickness greater than the wall thickness of the tube which resulted in a bulge in the inner and outer walls of the tube. When another device or tube with a stripe was connected for fluid tight and electrical connection, the engaged bulging stripes tended to prevent a fluid tight connection and thus tended to result in fluid leakage. Also, in such devices, where a stripe of one tube was to be connected to the stripe of another tube, there was danger of misalignment of the stripes where they were to engage, and thus presented the danger of not obtaining electrical interconnection between the conductive stripes of the tubes.

SUMMARY OF THE PRESENT INVENTION

It is therefore an object of the present invention to provide a plastic tube having a conductive stripe for preventing the accumulation of electrostatic charges thereon which has connector means for connecting another member to the tube which has conductive material thereon, wherein the connector means is simple in construction and use and provides reliable mechanical and electrical interconnection between the tube and member, and wherein the above-mentioned undesirable features are substantially obviated.

Another object is to provide a simple and economical method of making tubes of the above type.

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In accordance with one form of the present invention, a plastic tube is provided which has a conductive stripe and an integral connector provided with a conductive coating which is connected with the conductive stripe and adapted to be engaged for electrical contact with a member to be connected with the tube. In accordance with another form of the invention, conductive plastic tubing is made by extruding tubing, applying a conductive stripe longitudinally of the tubing, cutting the tubing through to provide a tube with a connector and coating the connector with a conductive material so that it is in contact with the conductive stripe and engageable with a member to be connected with the tube.

These as well as other objects and advantages of the present invention will become more apparent from the following detailed description and accompanying drawing in which like reference characters indicate like parts.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of extruding apparatus used in the manufacture of plastic tubing in accordance with a preferred embodiment of the present invention.

FIG. 2 is a fragmentary plan view, partly in cross-section, of plastic tubing formed by the apparatus of FIG. 1.

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a diagrammatic view illustrating another step in the manufacture of conductive plastic tubing in accordance with the preferred embodiment of the present invention;

FIG. 5 is a plan view illustrating the end connectors of a pair of finished conductive tubes made in accordance with the present invention.

FIG. 6 is a plan view on a reduced scale of the tubes of FIG. 5 but showing them connected together; and

FIG. 7 is a cross-sectional view on an enlarged scale of the interconnected end connectors of the tubes of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, there is shown in FIG. 1 for the purpose of illustration, extruding apparatus, indicated at 10, which can be used in the process of making conductive tubing in accordance with the present invention.

Extruding apparatus 10 is shown including an extruder 14 for supplying molten plastic to a tube forming die 16 through a one-way check valve 18. A piston operated injection-accumulator 20 is shown connected between the valve and die to selectively withdraw plastic from the flow path and inject accumulated plastic into the path. Air is injected into the tubing lumen 21 and controlled by a conventional air control member 22. A programmer or central control 24 is connected to the air control member 22, an injector-accumulator controller 26, and a speed control 28 for controlling the extruder 14. By programming the injection and withdraw phases of the injector-accumulator with the speed of the extruder and injection of air, tubing extrudate 29 having enlarged portions or bubbles 30 along the length thereof and main portions 32 of constant diameter, as seen also in FIG. 2, is readily pro-

duced. Each bubble 30 tapers radially inwardly from the middle portion of greatest diameter toward its opposite ends. For a further detailed description of apparatus for producing tubing having walls which vary in thickness and which vary in diameter, reference may be made to U.S. Pat. No. 3,674,404.

The tubing 29 is preferably formed of a flexible, transparent vinyl chloride polymer, although other well-known plastic materials, for example, a copolymer of vinyl chloride (e.g., 85 percent by weight) and vinyl acetate (15 percent by weight), and ether or ester type thermoplastic polyurethanes may be used.

In addition to producing portions 32 of constant diameter and the conical-ended bubbles 30, a flexible conductive filament or stripe 34 (FIG. 2) is applied longitudinally of the tubing 29. This is accomplished in the illustrated embodiment by providing an extruder 37 and speed control 38 operated by the programmer 24. The extruder 37 supplies conductive plastic material 40 through a small passage or tube 39 extending through the die to the plastic tubing 29 near the die outlet orifice. In this way, the material 40 is applied as a conductive stripe 34 which is continuously extruded the entire length of the tubing and simultaneously with the tubing. The stripe 34 is illustrated in FIG. 3 as extending slightly radially into the wall of the tubing and protruding only slightly above the outer periphery, although various modifications are possible. If, for example, the right end of tube 39 is moved further into the path of the molten plastic, the stripe will further penetrate the tubing wall, and vice versa. The stripe 34 may extend to the interior wall of the tubing or be applied only to the exterior surface of the tubing.

The conductive plastic material 40 preferably is a vinyl chloride compound with conductive carbon particles or powder in an amount to make the stripe 34 sufficiently conductive. For example, the material forming the stripe 34 may contain 40 percent (by weight) commercial powdered conductive carbon and 60 percent vinyl chloride compound. While powdered metals may be used in some cases, carbon has an inertness which is desirable for many applications, such as for the medical and surgical fields. After the extruded tubing 29 and stripe 34 have cooled, the tubing is predeterminately cut along its length to provide tubes of desired lengths with opposed ends of preselected diameter or shape. In FIG. 2, lines 41 and 42 represent points along the tubing 29 at which it is preferably cut to provide tubular members or tubes, such as indicated at 43 in FIGS. 4–7, of predetermined length having integral end portions or end connectors 44 and 46, and a portion of conductive stripe 34 extending end-to-end and indicated at 34a in FIGS. 4–7. Connector 44 has interior walls 45 (FIG. 7) that taper or flare radially outwardly towards its free end, and integral connector 46, at the opposite end of the tube, has exterior walls 48 (FIG. 4) that taper radially inwardly towards its free end.

The integral connector 44 of tube 43 is now provided with a conductive coating or layer 50 on the end thereof (FIGS. 5–7) which is in electrical contact with conductive stripe 34a and which is adapted to make electrical contact with a conductive element of another member, such as another tube identical to tube 43, as will be more fully explained hereinafter. In the illustrated embodiment, this conductive layer 50 is a flexible conductive plastic coating or film applied by a dipping step, as illustrated in FIG. 4. The connector 44 is dipped into a solution of conductive material 52 disposed in a container or tank 53. The solution 52 includes a conductive plastic material, preferably vinyl chloride plastic and conductive carbon powder, and a suitable high solvating solvent, such as cyclohexanone, tetrahydrofuran or the like. For example, the conductive plastic material may be a mixture of 40 percent (by weight) conductive carbon powder and the remainder vinyl chloride compound, the same as that of stripe 34. The solution may contain about 20 percent (by weight) conductive plastic material and 80% tetrahydrofuran.

The end of the integral connector 44 is dipped into the solution and the liquid coating on its end is air dried to evaporate the solvent and form the conductive plastic layer or coating 50. The layer 50 is shown covering the end of the stripe 34a so that it is in good electrical contact with it. The conductive layer 50, as seen also in FIG. 7, tenaciously adheres to the plastic tube 43 and extends over the end of the connector 44 and longitudinally in the reverse direction along the interior wall 45 of the tube. The coating 50 thus includes an external band 58 integral with an annular end portion 60 which adheres to the tip end of the connector 44 and which also connects with a band 62 adhering to the interior wall 45 of the tube.

Preferably, the solvent used in the solution 52 is one that is also a solvent for the material of tubing 29 so that it attacks or slightly dissolves the surface of the tubing material to effect an intermingling of the plastic materials or migration of the conductive plastic into the tube material. In this way, there is an interface layer or zone which includes the conductive plastic material and the material of tube 43 so that layer 50 is integrally connected to the tube and will not peel off. The solvent is preferably also a solvent for the plastic material of stripe 34a. Thus, in the preferred embodiment, the solvent, tetrahydrofuran or cyclohexanone, serves as a solvent and attacks a surface layer of the stripe 34a and tube 43 so that the layer 50 is bonded with them.

The thickness of layer 50 is substantially less than that of walls of the plastic tube 43, such as less than one-tenth of the wall thickness. For example, the wall thickness of the constant diameter portion 32 of the tube may be .125 of an inch while the thickness of layer 50 may be 0.001 or 0.002 of an inch. Preferably, layer 50 is less than 0.010 of an inch. By employing a conductive plastic layer of this type, considerable savings in material and cost are realized when compared to the use of a separate connector. Also, no additional adhesive is required.

In FIGS. 5–7, generally second tube identical to tube 43 is indicated at 43'. In FIGS. 6 and 7, the tubes 43 and 43' are shown interconnected in fluid tight connection with their conductive stripes 34a and 34b in electrical connection. The coated interior wall 45 of the connector 44 defines a generally conical bore to receive the end or connector 46' of tube 43' in fluid tight sealing engagement. It will be seen that the plastic conductive stripe 34b on the external tapered walls 48' of connector 46' engages, in good electrical contact, the internal plastic conductive band 62 of the coating 50 on the connector 44, and is thus in electrical connection with stripe 34a. The stripes 34a and 34b may be grounded as indicated in FIG. 6 by any suitable ground wire.

Since the conductive plastic band 62 extends entirely around the connector wall 45 for 360°, the stripes 34a

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and 34b need not be aligned with each other for good electrical connection, that is, the tube connector end 46' may be inserted at any angular relationship with respect to the connector 44 and stripes 34a and 34b will be in good electrical connection. In the preferred embodiment, the plastic material of the tube 43, stripe 34a and coating 50 are all based on the same plastic material, in this case, vinyl chloride with the result that the adhesive bonds between the plastic stripe, coating, and the tube are excellent.

The connectors 44 and 46 have walls which are sufficiently thick to permit manual connection of them in sealing engagement with another member without kinking. This is accomplished by controlling the extrudate 29 in a manner to provide the bubbles 30 in FIG. 2 with walls which are thicker than the walls of constant diameter portions 32. The walls of the bubbles become thinner as they approach the portions 32.

While the preferred method of providing a conductive coating on the connector end includes dipping in a solvent solution and then drying to release the solvent, other methods, such as spraying and the like, can be used. Where desired, both end connectors of each tube can be advantageously provided with a conductive plastic coating such as coating 50.

While the tubing 29 is shown severed at locations 41 and 42 to provide tapered connectors 44 and 46, such tubing can be severed at other locations where desired. For example, the tubing may be severed at a portion 32 of constant diameter to provide a connector which does not taper. Such a straight end connector can be inserted in fluid tight relation into a radially outwardly flared connector of suitable size or it can receive, in fluid tight relation, a connector which is tapered radially inwardly and of suitable size.

While the stripe 34a is preferably extruded onto the molten tubing 29 as described and illustrated herein, a suitable conductive wire or filament may be applied to the tubing after it has been cooled. Also, the tubing may be cut into desired lengths of tubing and the conductive stripe then applied in a suitable manner to each tubing length.

As is well known in the art, the plastic materials used in the tubing, stripe and conductive layer may, of course, include plasticizers that provide a desired flexibility or other materials to provide other desired final characteristics. Also, the tubing may be formed or extruded from rubber and various compositions thereof with the conductive stripe and conductive layer formed from well-known conductive rubber compounds.

In view of the above, it will be seen that the objects of the invention, as well as other advantageous results are obtained. As various changes could be made in the above disclosure without departing from the scope of the invention, it is intended that all matter in the above description or shown in the drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A medical tube comprising a tubular member of plastic material including an integral connector at one end having an interior wall tapering radially outwardly toward the free end thereof for receiving in fluid tight communication another member having electrically conductive means on the exterior thereof, an electrically conductive plastic stripe adhering to and extending generally longitudinally along substantially the entire length of said tubular member for preventing the accumulation of electrostatic charges on the tube, said stripe having a width substantially narrower than that of said tubular member and having the radially outer surface thereof exposed, and a coating of electrically conductive plastic material adhering to said connector and including a coating portion on the exterior wall of said connector covering and in electrical contact with a part of said stripe, a coating portion on the interior wall of said connector extending over a substantial circumferential surface area thereof for electrical contact engagement with the conductive means on the other member when the other member is connected in fluid communication with said connector, and a coating portion on the free end of said connector electrically connecting the coating portion on the interior wall of said connector to the coating portion on the exterior wall of said connector, the thickness of said coating being less than that of the wall of said tubular member.

2. The medical tube of claim 1 wherein said tubular member comprises vinyl chloride.

3. The medical tube of claim 2 wherein said stripe and said coating comprise conductive carbon.

4. The medical tube of claim 1 wherein said tubular member, said stripe, and said coating all include the same type of plastic material.

5. The medical tube of claim 4 wherein said same type of plastic material comprises vinyl chloride.

6. The medical tube of claim 1 wherein the thickness of said coating is less than 0.01 of an inch.

7. The method of making a medical tube with means for preventing the accumulation of electrostatic charges thereon and adapted for connection with another member which has conductive means thereon, comprising the steps of forming a tube of plastic material having a stripe of electrically conductive plastic material having a width substantially narrower than the width of the tube and adhering to and extending along substantially the entire length of the tube with the radial outer surface thereof exposed, and an integral tube connector at one end of the tube with the interior walls thereof tapering radially outwardly toward the free end thereof for receiving said other member in fluid tight frictional engagement, applying a liquid coating comprising an electrically conductive material and a plastic material onto said connector to coat the interior, exterior, and free end walls of said connector with the coating on the exterior of said connector extending over a portion of said stripe and in electrical contact therewith, and solidifying the coating in situ to form a conductive plastic coating adhering to said connector for connecting the conductive means of the other member when it is connected to said connector in electrical connection with said stripe.

8. The method of claim 7 wherein the plastic materials of said tube, stripe, and coating are of the same type.

9. The method of claim 8 wherein said same type of plastic material comprises vinyl chloride.

10. The method of claim 9 wherein said liquid includes a solvent of the type that attacks vinyl chloride.

11. The method of claim 7 wherein said liquid includes a solvent of a type that attacks the plastic materials of said tube, stripe, and coating to bond said coating to said tube and said stripe.

12. The method of claim 11 wherein said step of forming said tube comprises extruding vinyl chloride compound in tube form, and simultaneously extruding said stripe with the extrusion of said tube.

13. The method of claim 7 wherein said step of applying the liquid coating comprises dipping the connector into a quantity of the liquid coating.

* * * * *

579

Exhibit BT
(not admitted in evidence).

RECEIVED
JUL 8 - 1968
HEALTH AND SCIENCE
INTERNAL COMMUNICATION

Brunswick CORPORATION

SUBJECT DAVID SHERIDAN

Mr. William L. Niemann
DEPT. Law
LOCATION Home Office

DATE July 5, 1968
COPIES TO

FROM K. A. Marshall
DEPT. Health & Science
LOCATION St. Louis

RECEIVED
JUL 8 - 1968
LAW DEPT.

Dear Bill:

After talking with you, I reviewed again with John the basic objectives that we have in mind. A couple of points that I think are important.

John makes it clear that our desire is to preclude Dave's ingenuity and imagination from figuring out ways to do what we are able to do with the use of his patents. Therefore, we would not be interested in giving him the right to do what anyone else can do. He has proven to be more imaginative in these areas.

Accordingly, what we want to preclude him from doing is manufacturing a product which incorporates the features around which we have built our line and which features come to us as a result of his patents. I don't think we care whether he does this by extrusion, molding, or what-have-you. It doesn't appear to me that this is the direction in which the wording has been heading, and while this may be a more difficult direction, that is what we are trying to achieve.

Here are some words which I have not put together with any great thought, but perhaps they indicate what I am thinking of.

---- catheter or catheter product which incorporates features or configurations of a "bubble," x-ray line or conductive line identical or similar to the type now manufactured by Sherwood utilizing the licensed patents.

The other key point we are concerned with is the definition of a licensed product. Here are a couple of crude thoughts in that area that I think I could apply, although I don't contend they are legal in their wording.

a) On the "net sales" price of the integrated product or complex if that portion of the integrated product or complex which is the licensed product cannot stand alone as a functional product.

DEFENDANT'S EXHIBIT
BT id

b) On the "net sales" price of the licensed product, relative to the established price for an equivalent item, if the licensed product is merely one unit of an integrated product or complex.

In the latter case I have tried to establish a basis for relating the net sales price of the licensed product to that same product which we may sell in another form, which will usually be a variation in packaging. You pick out the equivalent item, which is closest to it, and price it in the same way if you are selling it to yourself. I think this would work and I tried it on a few products, but, of course, it is my interpretation of my own words.

I shall await to hear from you.

Sincerely,

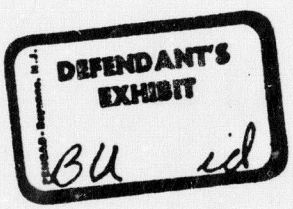
Exhibit BU

581

(not admitted in evidence)

TECHNICAL SUPPORT BULLETIN

Static Electricity and Electrically Susceptible Patients



Static Electricity and Electrically Susceptible Patients

ABSTRACT

This bulletin describes an aspect of electrical hazards in hospitals that has been essentially ignored. The National Fire Protection Association does an excellent job of explaining the potential fire hazards of static electricity, and the Association for the Advancement of Medical Instrumentation does an excellent job of explaining the potential hazards of current leakage from electronic instrumentation with electrically susceptible patients. But no organization to date has explained the potential hazards of static electricity and the electrically susceptible patient. This bulletin addresses itself to the question.

ELECTRICITY

Electricity can be a study of electrons. Electrons are charged particles that are held in orbit around nuclei of atoms. Electrical current is the movement of an electron from the orbit of one atom to the orbit of another atom. In a wire, current is the movement of these electrons up and down along the wire. To break an electron out of one orbit and into another, a certain amount of pressure must be exerted on the electron. This pressure, (measured in volts) causes current to flow (measured in amperes). Some atoms hold on to their electrons more tightly than others and are more resistant to letting electrons break out of their orbits. Those types of atoms that hold on to their electrons very tightly are said to be non-conductors and are resistant (measured in ohms) to current flow. The amount of current flow is proportional to the pressure and resistance in a given system.

When two non-conductors are rubbed against each other, they will "rub off" electrons from one surface to the other. This excess of electrons causes a great deal of pressure (voltage) to develop. The pressure will be dissipated, if the electrons can be conducted, to anything of neutral or opposite pressure. An example of this is when someone walks on carpets with street shoes. The rubbing action of the shoes on the carpet develops an electron pressure in the shoe. This pressure is slowly conducted to the body of the person, which was neutral but becomes "pressurized." This pressure may be relieved quickly by the person coming close enough to, or touching a good conductor of neutral or opposite pressure. This is the process we have all felt: static electricity build-up and sudden discharge. Actually this static electricity build-up can become quite high. A level of pressure of 500 to 1000 volts is not unusual. (For a more thorough discussion of the process of static electricity build-up and discharge see the National Fire Protection Association Recommended Practice on Static Electricity, 1972 (NFPA No. 77).1

ELECTRICITY AND CARDIOLOGY

The normal heart function is controlled by a very low level of electrical pressure (volts). At certain times in the heart cycle, a static discharge may cause cardiac arrest. Hochberg states:

> "The effects of electricity on heart rhythm are best understood by relating them to the electrophysiologic events associated with myocardial contraction. The myocardial cell membrane is normally polarized (charged) at a level of −0.09 volts across its membrane. When the muscle is stimulated by chemical, neurologic, or electrical means, or by contiguous muscle contraction, it rapidly depolarizes and the membranes become slightly positive. This

depolarization is represented on the surface electrocardiogram as the QRS complex. It is the electrical phenomenon which triggers the chemical processes in the cardiac muscle causing systole or mechanical contraction. During most of systole, the cell membranes are in the 'absolute refractory period' and cannot be further stimulated. As the membranes repolarize, they enter the 'relative refractory period,' wherein current can cause the cells to depolarize and the muscle to contract.

"The last 0.06 seconds of systole (part of the relative refractory period) are a unique portion of the cardiac cycle called the vulnerable period."[2]

It is called the vulnerable period because a single isolated shock, if strong enough, can cause ventricular fibrillation, as reported by Wiggers and Wegria:

"When the bias voltage was reduced sufficiently on the discharge tube, it conducted and discharged a 4-micro-farad condenser charged with 300 volts.

"Repeated tests on seventeen different dogs demonstrated consistently that stimuli falling . . . during the summit at various intervals up to about 0.06 second before the end of contraction, marked by the incisura, produce either a small premature contraction early in following diastole, or ventricular fibrillation . . ."[3]

MICROSHOCK—THE ELECTRICALLY SUSCEPTIBLE PATIENT

The shocking of the heart, as described above is currently referred to in the literature as "microshock." Electrically susceptible patients are those that are subject to this microshock because of exposure of the heart to small amounts of electricity. The literature is abundant with examples: patients in the Cardiac Cath Lab, patients with Central Venous Pressure Sets, patients with Blood Gas Analyzers, etc. One of the examples is in the use of electrosurgical cautery machines: the application of the active lead should not be made near the heart, and the patient ground should not be near the heart. Obviously, a static discharge in surgery, in the area of the heart should also be avoided.

EXAMPLES

Suction tubing is usually made of PVC (polyvinyl chloride) which is a non-conductor. It routinely rubs on surgical drapes, gowns, and other non-conductive materials and will build-up a static charge. This may then discharge directly into the operative field when applied for suction. Proper use of conductive tubing will prevent this hazard. The shuffling of a surgeon's feet will build-up a static charge, unless he is wearing conductive shoe covers. If the surgeon puts his hand (or an instrument in his hand) into the surgical field, there may be a discharge into the field.

Conversely, use of conductive materials in more remote areas from the surgical field, or away from an electrically susceptible patient, is less significant in reduction of microshock hazards. The risk of explosions with the use of flammable anesthetics may still be significant. However, there is little justification for the use of conductive kick bucket liners, conductive back table covers, or similar products to reduce microshock hazards.

CONCLUSION

Any steps that can be taken to reduce static build-up and discharge in the surgical field, or on electrically susceptible patients, should be taken. Proper grounding of people, and proper use of conductive materials will minimize static build-up and discharge. These steps will minimize microshock hazards on electrically susceptible patients.

REFERENCES

1. *Static Electricity 1972*, Recommended Practice on Static Electricity, NFPA No. 77, 60 Batterymarch Street, Boston, Massachusetts 02110.
2. "Effects of Electrical Current on Heart Rhythm", Hochberg, H.M., *American Journal of Nursing*, pp. 1390-1394, July 1971.
3. "Ventricular Fibrillation Due to Single Localized Induction and Condenser Shocks Applied During the Vulnerable Phase of Ventricular Systole.", Wiggers, C. J. and Wegria, R., *American Journal of Physiology*, 128:500-505, 1946.

PURCHASE ORDER NUMBER

90.0944

THIS NUMBER MUST APPEAR ON ALL PACKAGES AND CORRESPONDENCE PERTAINING HERETO

AMERICAN HOSPITAL SUPPLY CORPORATION

585

DES PLAINES, ILL. 60016

Exhibit #2

Exhibit BX

Previously quoted 11/22/71

National Catheter Corporation
Hook Road
Argyle, New York 12809

Attn. David S. Sheridan

for conductive tubing

BLANKET ORDER - See Additional Terms & Conditions on Attached Form #102166 Dated 10/66

SHIP PREPAID - DO NOT SHIP COLLECT.
ADD TRANSPORTATION CHARGES SEPARATE ITEM TO SAME INVOICE COVERING MERCHANDISE
WHEN TERMS ARE NOT F.O.B. DESTINATION WE WILL NOT ACCEPT SEPARATE INVOICES FOR TRANSPORTATION CHARGES
SUBMIT INVOICE IN TRIPLICATE

DELIVER BY DATE 12/1/71

SHIPPING INSTRUCTIONS

CURB DOOR DELIVERY IS REQUIRED
TO AVOID DELAY SHIP AT PRICES ARE INCORRECT, BUT ADVISE BY MAIL

11/14/72 Lofik to quantities of NCC for Barb

		CATALOG NO.	DESCRIPTION	COST
			~~AMERICAN LABEL~~	
NCC	14300ea.	1023-6	Conductive Connection Tubes 5mm x 6' (57%) @52¢ each	$ 7,436.
	2000ea.	1023-12	5mm x 12' (8%) @$1.12 each	$ 2,240.
	7300ea.	1027-6	7mm x 6' (29%) @84¢ each	$ 6,132.
	1600ea.	1027-12	7mm x 12' (6%) @$1.81 each	$ 2,896.
			~~AMERICAN LABEL~~ TOTAL	$18,704.
NCC	25000ea.	1028	7mm x 6' Connection Tubes ~~@34¢ each~~ TOTAL	$ 8,500.
			GRAND TOTAL	$43,954.

Shipped 11/22/71 25,200

(Note: 50% of these items are to be shipped immediately to region stock; the other 50% of these items are to be held in NCC inventory.)

Fred Grossmann
Fred Grossmann
Vice President 12/1/71

CONDITIONS

STOCK PURCHASE ORDER

THIS ORDER IS SUBJECT TO CONDITIONS OF PURCHASE INCLUDING INDEMNIFICATION CLAUSES ON THE REVERSE SIDE.

ENTER THIS ORDER FOR STOCK, SUBJECT TO THE TERMS AND CONDITIONS HEREOF AND OF THE FORM NO. 102166 TO WHICH YOU AGREE BY YOUR ACCEPTANCE OF THIS ORDER

STOCK ORDER DEPT

DEFENDANT'S EXHIBIT
Mtn in 4/3/76
5X

4/4

PURCHASE ORDER NUMBER
N CODE
900943
THIS NUMBER MUST APPEAR ON ALL PACKAGES, ALL CORRESPONDENCE AND INVOICES.

prices per our quote 7 9/22/71

☐ STOCK ☐ IN & OUT ☐ MASTER

AMERICAN HOSPITAL SUPPLY
DIVISION OF AMERICAN HOSPITAL SUPPLY CORPORATION
1450 WAUKEGAN RD. McGAW PARK, ILL. 60085
312-689-8800

MAIL INVOICES TO OFFICE DESIGNATED BY REGION CODE ☐ AS INDICATED IN THE PURCHASE ORDER NUMBER UNLESS OTHERWISE SHOWN ABOVE BY CHECK MARK.

SPECIAL INSTRUCTIONS:

BLANKET ORDER - See Additional Terms & Conditions on Attached Form #102166 Dated 10/66

TO
National Catheter Corporation
Hook Road
Argyle, New York 12809

Attn. David S. Sheridan

1. SHIP PREPAID - DO NOT SHIP COLLECT.
2. ADD TRANSPORTATION CHARGES AS A SEPARATE ITEM TO SAME INVOICE COVERING MERCHANDISE WHEN TERMS ARE NOT F.O.B. DESTINATION. WE WILL NOT ACCEPT SEPARATE INVOICES FOR TRANSPORTATION CHARGES.
3. SUBMIT INVOICE IN DUPLICATE

ORDER DATE: 12/1/71
SHIPPING INSTRUCTIONS: SAME DOOR DELIVERY IS REQUIRED. DO NOT DELAY SHIPPING IF PRICES ARE INCORRECT. BUT ADVISE BY MAIL

	QUAN.	UNIT	FACTORY NO.	CATALOG NO.	DESCRIPTION	COST
	~~2Mx~~				Urethral Catheters ("Rob-Nels")	
1	2M	ea.	2000	160-08	8 FR (8%) @12¢ each	$ 240
	3M	ea.	3000	160-10	10 FR (15%) @12¢ each	$ 360
2	3M	ea.	3000	160-12	12 FR (15%) @12¢ each	$ 360
	10M	ea.	10000	160-14	14 FR (40%) @12¢ each	$ 1,200
3	5M	ea.	5000	160-16	16 FR (20%) @12¢ each	$ 600
	2M	ea.	2000	160-18	18 FR (10%) @12¢ each	$ 240
4					TOTAL	$ 3,000
5					NCC Coude Suction Cath w/o Control	
	6300	ea.	7000	7001108	10 FR (25%) @25¢ each	$ 1,575
6	12500	ea	12000	12001148	14 FR (50%) @25¢ each	$ 3,125
	6200	ea.	6000	6001108	18 FR (25%) @25¢ each	$ 1,500
7					TOTAL	$ 6,250
8					NCC Coude Suction Cath w/ Vactrol	
	6300	ea.	7000	6001109	10 FR (25%) @30¢ each	$ 1,890
9	12500	ea.	12000	11001149	14 FR (50%) @30¢ each	$ 3,750
	6200	ea.	6000	5001189	18 FR (25%) @30¢ each	$ 1,860
10					TOTAL	$ 7,500
11						
12					(Continued)	
13						

22,000 ordered-to be billed all above as stated $ on P.O.

CONDITIONS

NO CHARGE WILL BE ALLOWED FOR BOXING AND CARTAGE.
ALL GOODS ARE SUBJECT TO INSPECTION ON ARRIVAL. VENDOR CASH DISCOUNT TERMS BEGIN WITH DATE MERCHANDISE IS RECEIVED AND INSPECTED IN OUR WAREHOUSE.
IN THE FULFILLMENT OF THIS ORDER THE SELLER AGREES TO COMPLY WITH ALL APPLICABLE STATE, FEDERAL AND LOCAL LAWS, RULES AND REGULATIONS.
THIS ORDER IS SUBJECT TO CONDITIONS OF PURCHASE, INCLUDING INDEMNIFICATION CLAUSES, ON THE REVERSE SIDE.

STOCK PURCHASE ORDER

ENTER THIS ORDER FOR ABOVE MERCHANDISE SUBJECT TO TERMS AND CONDITIONS PRINTED AND WRITTEN HEREON TO WHICH YOU AGREE BY YOUR ACCEPTANCE OF THIS ORDER.

STOCK ORDER DEPT.

PURCHASE ORDER NUMBER
REGION CODE 900944
THIS NUMBER MUST APPEAR ON ALL PACKAGES B/L CORRESPONDENCE AND INVOICES

Prices per quote of 9/22/71

☐ STOCK ☐ IN & OUT ☐ MASTER

TO
National Catheter Corporation
Hook Road
Argyle, New York 12809

Attn. David S. Sheridan

AMERICAN HOSPITAL SUPPLY
DIVISION OF AMERICAN HOSPITAL SUPPLY CORPORATION
900 1450 WAUKEGAN RD. McGAW PARK, ILL. 60085
312-689-8800

MAIL INVOICES TO OFFICE DESIGNATED BY REGION CODE ☐
AS INDICATED IN THE PURCHASE ORDER NUMBER UNLESS OTHERWISE SHOWN ABOVE BY CHECK MARK.

SPECIAL INSTRUCTIONS:

BLANKET ORDER - See Additional Terms & Conditions on Attached Form #102166 Dated 10/66

1. SHIP PREPAID - DO NOT SHIP COLLECT.
2. ADD TRANSPORTATION CHARGES AS A SEPARATE ITEM TO SAME INVOICE COVERING MERCHANDISE WHEN TERMS ARE NOT F.O.B. DESTINATION. WE WILL NOT ACCEPT SEPARATE INVOICES FOR TRANSPORTATION CHARGES.
3. SUBMIT INVOICE IN DUPLICATE

1/14/72 + quantities of NCC labels + product per Barb Fromm

ORDER DATE 12/1/71

SHIPPING INSTRUCTIONS

STORE DOOR DELIVERY IS REQUIRED. DO NOT DELAY SHIPPING IF PRICES ARE INCORRECT, BUT ADVISE BY MAIL

	QUAN.	UNIT	FACT. CAT. NO.	CATALOG NO.	DESCRIPTION	COST
1					~~AMERICAN CABLE~~ Conductive Connection Tubes	
2	14300ea.		1.48	1023-6	5mm x 6' (57%) @52¢ each	$ 7,436
3	2000ea.		1.12	1023-12	5mm x 12' (8%) @$1.12 each	$ 2,240
4	7300ea.		.84	1027-6	7mm x 6' (29%) @84¢ each 613.2 4	$ ~~6,732~~
5	1600ea.		1.83	1027-12	7mm x 12' (6%) @$1.81 each	$ 2,896
	25200				TOTAL	$18,704
					~~AMERICAN CABLE~~	
6	25000ea.			1028	7mm x 6' Connection Tubes ~~.34~~ each	
	25,000 Shipped 8/2/72				TOTAL	$ 8,500
7					GRAND TOTAL	$43,954
8						
9					(Note: 50% of these items are to be shipped immediately to region stock; the other 50% of these items are to be held in NCC inventory.)	
10						
11						
12						
13						

Fred Grossmann
Fred Grossmann
Vice President 12/1/71
STOCK PURCHASE ORDER

CONDITIONS.

NO CHARGE WILL BE ALLOWED FOR BOXING AND CARTAGE.
ALL GOODS ARE SUBJECT TO INSPECTION ON ARRIVAL. VENDOR CASH DISCOUNT TERMS BEGIN WITH DATE MERCHANDISE IS RECEIVED AND INSPECTED IN OUR WAREHOUSE.
IN THE FULFILLMENT OF THIS ORDER THE SELLER AGREES TO COMPLY WITH ALL APPLICABLE STATE, FEDERAL AND LOCAL LAWS, RULES AND REGULATIONS.
THIS ORDER IS SUBJECT TO CONDITIONS OF PURCHASE, INCLUDING INDEMNIFICATION CLAUSES, ON THE REVERSE SIDE.

ENTER THIS ORDER FOR ABOVE MERCHANDISE SUBJECT TO TERMS AND CONDITIONS PRINTED AND WRITTEN HEREON TO WHICH YOU AGREE BY YOUR ACCEPTANCE OF THIS ORDER.

STOCK ORDER DEPT.

BY

AMERICAN HOSPITAL SUPPLY CORPORATION

PURCHASE ORDER NUMBER
REGION CODE 90 773622X1
THIS NUMBER MUST APPEAR ON ALL PACKAGES B/L CORRESPONDENCE AND INVOICES

Prices per enquiry 3/14/72

Of-90 sheets per Bart end of [illegible]

4-00 pc 9/15/44

This P.O. 18. FRAME 7

STOCK ☐ IN & OUT ☐ MASTER ☐

MAIL INVOICE TO ADDRESS DESIGNATED BY REGION CODE AS INDICATED IN THE PURCHASE ORDER NUMBER UNLESS OTHERWISE SHOWN ABOVE BY CHECK MARK. ☐ HOLD

SPECIAL INSTRUCTIONS:

TO

National Catheter Corp.
Hook Road
Argyle, New York

Attn: David Sheridan

BLANKET ORDER -- See Additional Terms & Conditions on Attached Form #102166, Dated 10/66, And Special Terms Below. F.O.B.

1. SHIP PREPAID. DO NOT SHIP COLLECT.
2. ADD TRANSPORTATION CHARGES AS A SEPARATE ITEM TO BASE INVOICE COVERING MERCHANDISE WHEN TERMS ARE NOT F.O.B. DESTINATION. WE WILL NOT ACCEPT SEPARATE INVOICES FOR TRANSPORTATION CHARGES.
3. SUBMIT INVOICE IN DUPLICATE

ORDER DATE: April 18, 1972

SHIPPING INSTRUCTIONS: STORE DOOR DELIVERY IS REQUIRED. DO NOT DELAY SHIPPING IF PRICES ARE INCORRECT, BUT ADVISE BY MAIL

	QUAN.	UNIT	FACT. CAT. NO.	CATALOG NO.	DESCRIPTION	COST
3/24 = comp	25M	ea	1023-6	18193-056	5mm x 6' Clear Conductive Connecting Tube, Sterile...50 per case	$ .48e
11/28 = comp	25M	ea	1027-6	18193-076	7mm x 6' Clear Conductive Connecting Tube, Sterile...50 per case	.80e
11/10 = comp	5M	ea	1023-12'	18193-512	5mm x 12' Clear Conductive Connecting Tube, Sterile...10 per box, 10 boxes per case	$1.08e
10/31 = comp	5M	ea	1027-12	18193-712	7mm x 12' Clear Conductive Connecting Tube, Sterile...10 per box, 10 boxes per case	$1.77e
10/24 = comp	1M	ea	1023-20	18193-520	5mm x 20' Clear Conductive Connecting Tube, Sterile...10 per box, 10 boxes per case	$1.91e
10/26 = comp	1M	ea	1027-20	18193-720	7mm x 20' Clear Conductive Connecting Tube, Sterile...10 per box, 10 boxes per case	$3.11e
	1M	bx	1027	18194	100 Ft. Coils of Clear Conductive Tubing, 7mm I.D. w/funnels every 6' non-sterile, packed 100ft/bx.	$11.00
all comp	12/18/72					

CONDITIONS

NO CHARGE WILL BE ALLOWED FOR BOXING AND CARTAGE.
ALL GOODS ARE SUBJECT TO INSPECTION ON ARRIVAL. VENDOR SHALL BE NOTIFIED IF MERCHANDISE IS REJECTED AND INSPECTED IN OUR WAREHOUSE.
IN THE FULFILLMENT OF THIS ORDER THE SELLER AGREES TO COMPLY WITH ALL APPLICABLE FEDERAL AND LOCAL LAWS, RULES AND REGULATIONS.
THIS ORDER IS SUBJECT TO CONDITIONS OF PURCHASE, INCLUDING INDEMNIFICATION CLAUSES, ON THE REVERSE SIDE.

Frank Grossmann
Frederic Grossmann
Vice President

STOCK PURCHASE ORDER TOTAL $62,77

ENTER THIS ORDER FOR ABOVE MERCHANDISE SUBJECT TO TERMS AND CONDITIONS PRINTED AND WRITTEN HEREON TO WHICH YOU AGREE BY YOUR ACCEPTANCE OF THIS ORDER

STOCK ORDER DEPT

Exhibit CE-1

NATIONAL CATHETER CORPORATION

DAMAGES CLAIMED AS RESULT
OF LOST SALES TO
AMERICAN HOSPITAL SUPPLY CORPORATION

TOTAL SALES TO AHSC - 1974 (By stipulation-Plaintiffs Exhibit 43)	$1,008,432
SALES PER MONTH (1974 Average)	$ 84,036
LENGTH OF DELAY: 9 Months	
TOTAL SALES LOST (9 x $84,036)	$ 756,324
NET INCOME (before taxes) - 41% (By stipulation-Plaintiffs Exhibit 43)	
TOTAL DAMAGES CLAIMED ($756,324 x 41%)	$ 310,092.84

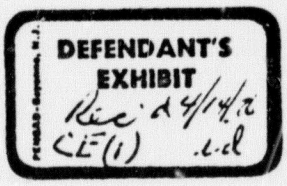


Exhibit 8

Patent Research Service RVICE
25854 143rd Ct. SE
Kent, WA 98031

DEFENDANT'S EXHIBIT Rec'd 4/13/76 CG

FIRST CLASS MAIL

SEATTLE, WA PM 7 APR 1976

RECEIVED APR 9 1976

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591

TO AVOID DUPLICATION - LIST ANY PRE-VIOUSLY PURCHASED REFERENCED PATS. USTAT #

Thank You!

PATENT RESEARCH SERVICE

Patent Research Service
25854 143rd Ct. SE
Kent, WA 98031

REFERENCED PATENT	DATE OF ISSUE	OUR FILE NO.
3,580,983	May 1971	

LETTER DATE	ORDER DATE	AMT. PD.	CHECK NO.
[illegible] 1975	[illegible]	$12.50	14138

Isaac S. Jackson,
Inventor.

OWNER OF REFERENCED PATENT

National Catheter Corp.
North Argyle, NY 12809

☐ CHECK HERE FOR INFORMATION ONLY - $10.00

☑ CHECK HERE FOR PHOTOCOPY OF NEW PATENT - $12.50

Please reprint name and address on other side if not

592

David S. Sheridan
National Catheter Corp.
Argyle, NY 12809

United States Patent [19]

Berliner et al.

[11] **3,914,002**

[45] **Oct. 21, 1975**

[54] **CONDUCTIVE TUBING AND METHOD OF MAKING SAME**

[75] Inventors: **Mayer Berliner**, Lake Luzerne; **James G. Stewart**, Amsterdam, both of N.Y.

[73] Assignee: **Sherwood Medical Industries Inc.**, St. Louis, Mo.

[22] Filed: **Apr. 17, 1974**

[21] Appl. No.: **461,563**

[52] U.S. Cl. ..... 339/16 R; 128/348; 174/47; 174/74 R; 264/105; 264/131; 317/2 J; 425/326 R

[51] Int. Cl.[2] F16L 11/12; H05F 3/02; A61M 25/00; B29D 23/04

[58] Field of Search ..... 174/47, 74 R, 78, 84 S; 128/2.05 R, 2.05 D, 348, 349 R, 350 R; 138/103, 109, 118, 120; 264/95, 104, 105, 131, 150, 173; 317/2 R, 2 J; 339/15, 16 R; 425/326 R

[56] **References Cited**

UNITED STATES PATENTS

2,153,199	4/1939	Miller	317/2 J
3,070,132	12/1962	Sherman	174/47 X
[illegible]	[illegible]	[illegible]	[illegible]
3,626,085	12/1971	Arndt et al.	174/73 R
3,674,404	7/1972	Burlis et al.	425/326 R

FOREIGN PATENTS OR APPLICATIONS

1,140,034	11/1962	Germany	174/47

OTHER PUBLICATIONS

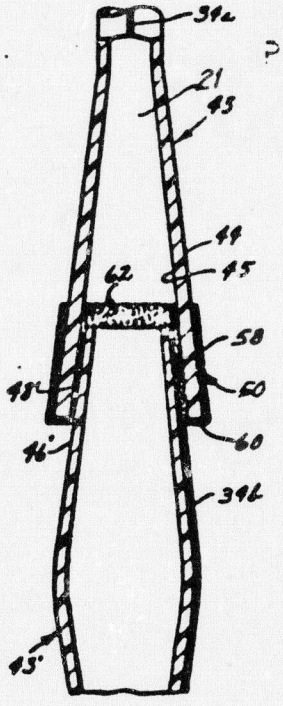
Pamphlet entitled "Argyle–The Standard of Excellence in Medical, Surgical Tubes and Catheters," published by Aloe Medical (Division of Brunswick), 16 pages.

Primary Examiner—Laramie E. Askin
Attorney, Agent, or Firm—Stanley N. Garber; William R. O'Meara

[57] **ABSTRACT**

A conductive plastic tube for preventing the accumulation of electrostatic charges having a conductive plastic stripe to be grounded and an integral tube connector provided with a conductive plastic coating covering the open end including external and internal walls of the connector and a portion of the stripe. The connector is adapted to connect the tube to another member in fluid tight relation and to electrically connect the conductive stripe to a conductive element of the other member. The tubing is extruded with a conductive stripe and spaced integral conical portions serving as end connectors when severed. The connector is dipped in a solvent dispersion of conductive plastic and thereafter removed and allowed to dry to produce a conductive plastic coating on the connector end.

13 Claims, 7 Drawing Figures



PATENT RESEARCH SERVICE
KENT, WASHINGTON 98031

9-4002

U.S. Patent Oct. 21, 1975 3,914,002

FIG. 1

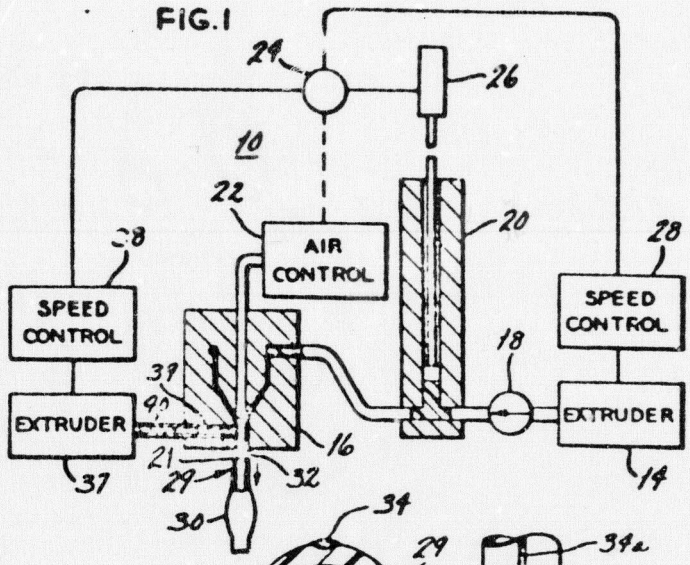


FIG. 2

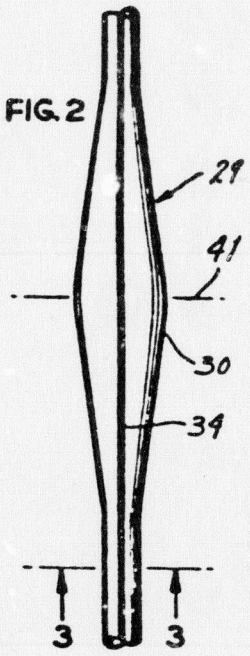


FIG. 3

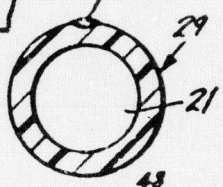


FIG. 4

FIG. 5

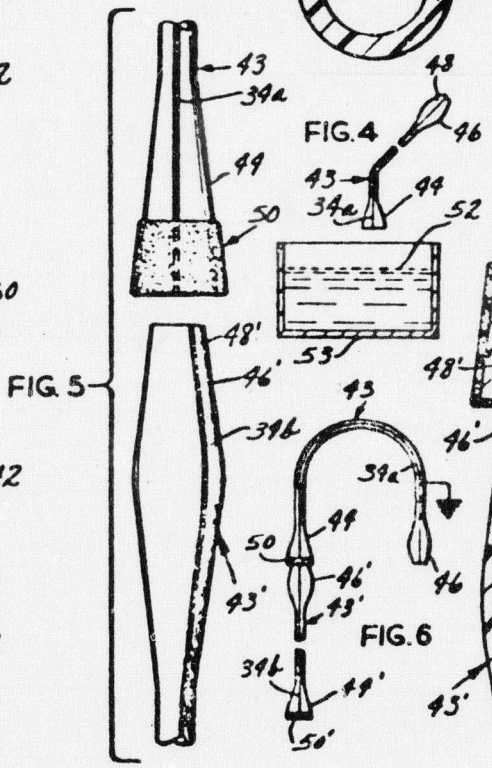
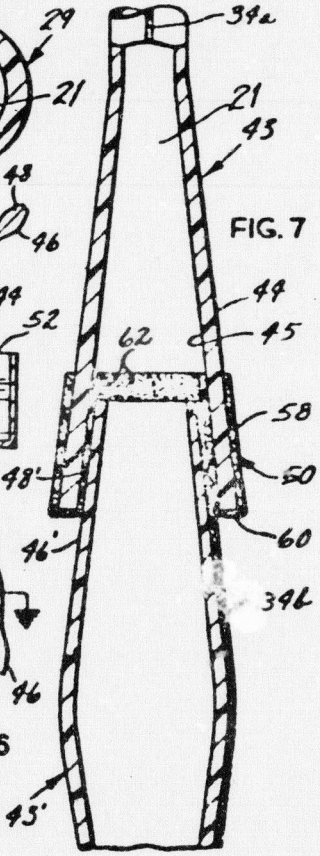
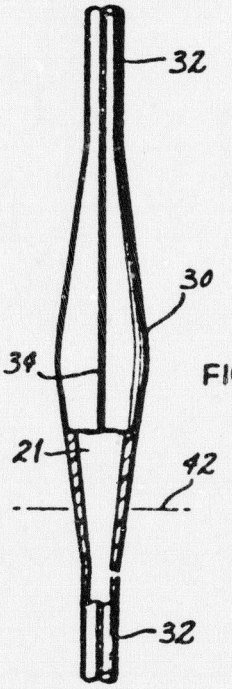


FIG. 6

FIG. 7





3,914,002

CONDUCTIVE TUBING AND METHOD OF MAKING SAME

BACKGROUND OF THE INVENTION

This invention relates to plastic tubing having a conductive stripe thereon for preventing the accumulation of electrostatic charges and more particularly to such plastic tubing with connector means for effecting fluid and electrical connection between the tubing and another member, and to a method of making tubing of this type.

Plastic tubing has been made with conductive plastic stripes or filaments along its length for grounding the tubing to prevent build-up of electrostatic charges and sparking. Such tubing is utilized where combustible atmospheric conditions may occur. For example, medical and surgical tubes such as catheters, suction tubes, oxygen and anesthesia administrating tubes and the like, are used in hospitals where combustible atmospheric conditions often occur. U.S. Pat Nos. 3,070,132 and 3,580,983, for example, disclose plastic tubing having longitudinally extending conductive plastic stripes or filaments for preventing electrostatic spark discharges.

There have been certain undesirable features associated with the use of such conductive tubes. In some cases, a special and relatively expensive connector or coupling element of metal or metal and plastic has been required to connect a tube in fluid tight connection and in electrical connection with another device, such as another conductive tube. In the above-mentioned U.S. Pat. No. 3,580,983, special molded fittings which may be made of the same material as the conductive plastic stripe, are secured to the end of a tube by fusion or cementing. Separate connectors or fittings not only increase the amount of material and other manufacturing costs, but increase the number of points of possible fluid leaks, as well as increase the number of electrical connections required. In some cases, tubing was provided with longitudinally conductive stripes or filaments having a thickness greater than the wall thickness of the tube which resulted in a bulge in the inner and outer walls of the tube. When another device or tube with a stripe was connected for fluid tight and electrical connection, the engaged bulging stripes tended to prevent a fluid tight connection and this tended to result in fluid leakage. Also, in such devices, where a stripe of one tube was to be connected to the stripe of another tube, there was danger of misalignment of the stripes where they were to engage, and this presented the danger of not obtaining electrical interconnection between the conductive stripes of the tubes.

SUMMARY OF THE PRESENT INVENTION

It is therefore an object of the present invention to provide a plastic tube having a conductive stripe for preventing the accumulation of electrostatic charges thereon which has connector means for connecting another member to the tube which has conductive material thereon, wherein the connector means is simple in construction and use and provides reliable mechanical and electrical interconnection between the tube and member, and wherein the above-mentioned undesirable features are substantially obviated.

Another object is to provide a simple and economical method of making tubes of the above type.

In accordance with one form of the present invention, a plastic tube is provided which has a conductive stripe and an integral connector provided with a conductive coating which is connected with the conductive stripe and adapted to be engaged for electrical contact by a member to be connected with the tube. In accordance with another form of the invention, conductive plastic tubing is made by extruding tubing, applying a conductive stripe longitudinally of the tubing, cutting the tubing through to provide a tube with a connector and coating the connector with a conductive material so that it is in contact with the conductive stripe and engageable with a member to be connected with the tube.

These as well as other objects and advantages of the present invention will become more apparent from the following detailed description and accompanying drawing in which like reference characters indicate like parts.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of extruding apparatus used in the manufacture of plastic tubing in accordance with a preferred embodiment of the present invention;

FIG. 2 is a fragmentary plan view, partly in cross-section, of plastic tubing formed by the apparatus of FIG. 1.

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a diagrammatic view illustrating another step in the manufacture of conductive plastic tubing in accordance with the preferred embodiment of the present invention;

FIG. 5 is a plan view illustrating the end connectors of a pair of finished conductive tubes made in accordance with the present invention;

FIG. 6 is a plan view on a reduced scale of the tubes of FIG. 5 but showing them connected together, and

FIG. 7 is a cross-sectional view on an enlarged scale of the interconnected end connectors of the tubes of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, there is shown in FIG 1 for the purpose of illustration, extruding apparatus, indicated at 10, which can be used in the process of making conductive tubing in accordance with the present invention.

Extruding apparatus 10 is shown including an extruder 14 for supplying molten plastic to a tube forming die 16 through a one-way check valve 18. A piston operated injection-accumulator 20 is shown connected between the valve and die to selectively withdraw plastic from the flow path and inject accumulated plastic into the path. Air is injected into the tubing lumen 21 and controlled by a conventional air control member 22. A programmer or central control 24 is connected to the air control member 22, an injector-accumulator controller 26, and a speed control 28 for controlling the extruder 14. By programming the injection and withdraw phases of the injector-accumulator with the speed of the extruder and injection of air, tubing extrudate 29 having enlarged portions or bubbles 30 along the length thereof and main portions 32 of constant diameter, as seen also in FIG 2, is readily pro-

duced. Each bubble 30 tapers radially inwardly from the middle portion of greatest diameter toward its opposite ends. For a further detailed description of apparatus for producing tubing having walls which vary in thickness and which vary in diameter, reference may be made to U.S. Pat. No. 3,674,404.

The tubing 29 is preferably formed of a flexible, transparent vinyl chloride polymer, although other well-known plastic materials, for example, a copolymer of vinyl chloride (e.g., 85 percent by weight) and vinyl acetate (15 percent by weight), and ether or ester type thermoplastic polyurethanes may be used.

In addition to producing portions 32 of constant diameter and the conical-ended bubbles 30, a flexible conductive filament or stripe 34 (FIG. 2) is applied longitudinally of the tubing 29. This is accomplished in the illustrated embodiment by providing an extruder 37 and speed control 38 operated by the programmer 24. The extruder 37 supplies conductive plastic material 40 through a small passage or tube 39 extending through the die to the plastic tubing 29 near the die outlet orifice. In this way, the material 40 is applied as a conductive stripe 34 which is continuously extruded the entire length of the tubing and simultaneously with the tubing. The stripe 34 is illustrated in FIG. 3 as extending slightly radially into the wall of the tubing and protruding only slightly above the outer periphery, although various modifications are possible. If, for example, the right end of tube 39 is moved further into the path of the molten plastic, the stripe will further penetrate the tubing wall, and vice versa. The stripe 34 may extend to the interior wall of the tubing or be applied only to the exterior surface of the tubing.

The conductive plastic material 40 preferably is a vinyl chloride compound with conductive carbon particles or powder in an amount to make the stripe 34 sufficiently conductive. For example, the material forming the stripe 34 may contain 40 percent (by weight) commercial powdered conductive carbon and 60 percent vinyl chloride compound. While powdered metals may be used in some cases, carbon has an inertness which is desirable for many applications, such as for the medical and surgical fields. After the extruded tubing 29 and stripe 34 have cooled, the tubing is predeterminately cut along its length to provide tubes of desired lengths with opposed ends of preselected diameter or shape. In FIG. 2, lines 41 and 42 represent points along the tubing 29 at which it is preferably cut to provide tubular members or tubes, such as indicated at 43 in FIGS. 4–7, of predetermined length having integral end portions or end connectors 44 and 46, and a portion of conductive stripe 34 extending end-to-end and indicated at 34a in FIGS. 4–7. Connector 44 has interior walls 45 (FIG. 7) that taper or flare radially outwardly towards its free end, and integral connector 46, at the opposite end of the tube, has exterior walls 48 (FIG. 4) that taper radially inwardly towards its free end.

The integral connector 44 of tube 43 is now provided with a conductive coating or layer 50 on the end thereof (FIGS. 5–7) which is in electrical contact with conductive stripe 34a and which is adapted to make electrical contact with a conductive element of another member, such as another tube identical to tube 43, as will be more fully explained hereinafter. In the illustrated embodiment, this conductive layer 50 is a flexible conductive plastic coating or film applied by a dipping step, as illustrated in FIG. 4. The connector 44 is dipped into a solution of conductive material 52 disposed in a container or tank 53. The solution 52 includes a conductive plastic material, preferably vinyl chloride plastic and conductive carbon powder, and a suitable high solvating solvent, such as cyclohexanone, tetrahydrofuran or the like. For example, the conductive plastic material may be a mixture of 40 percent (by weight) conductive carbon powder and the remainder vinyl chloride compound, the same as that of stripe 34. The solution may contain about 20 percent (by weight) conductive plastic material and 80% tetrahydrofuran.

The end of the integral connector 44 is dipped into the solution and the liquid coating on its end is air dried to evaporate the solvent and form the conductive plastic layer or coating 50. The layer 50 is shown covering the end of the stripe 34a so that it is in good electrical contact with it. The conductive layer 50, as seen also in FIG. 7, tenaciously adheres to the plastic tube 43 and extends over the end of the connector 44 and longitudinally in the reverse direction along the interior wall 45 of the tube. The coating 50 thus includes an external band 58 integral with an annular end portion 60 which adheres to the tip end of the connector 44 and which also connects with a band 62 adhering to the interior wall 45 of the tube.

Preferably, the solvent used in the solution 52 is one that is also a solvent for the material of tubing 29 so that it attacks or slightly dissolves the surface of the tubing material to effect an intermingling of the plastic materials or migration of the conductive plastic into the tube material. In this way, there is an interface layer or zone which includes the conductive plastic material and the material of tube 43 so that layer 50 is integrally connected to the tube and will not peel off. The solvent is preferably also a solvent for the plastic material of stripe 34a. Thus, in the preferred embodiment, the solvent, tetrahydrofuran or cyclohexanone, serves as a solvent and attacks a surface layer of the stripe 34a and tube 43 so that the layer 50 is bonded with them.

The thickness of layer 50 is substantially less than that of walls of the plastic tube 43, such as less than one-tenth of the wall thickness. For example, the wall thickness of the constant diameter portion 32 of the tube may be .125 of an inch while the thickness of layer 50 may be 0.001 or 0.002 of an inch. Preferably, layer 50 is less than 0.010 of an inch. By employing a conductive plastic layer of this type, considerable savings in material and cost are realized when compared to the use of a separate connector. Also, no additional adhesive is required.

In FIGS. 5–7, generally second tube identical to tube 43 is indicated at 43'. In FIGS. 6 and 7, the tubes 43 and 43' are shown interconnected in fluid tight connection with their conductive stripes 34a and 34b in electrical connection. The coated interior wall 45 of the connector 44 defines a generallly conical bore to receive the end or connector 46' of tube 43' in fluid tight sealing engagement. It will be seen that the plastic conductive stripe 34b on the external tapered walls 48' of connector 46' engages, in good electrical contact, the internal plastic conductive band 62 of the coating 50 on the connector 44, and is thus in electrical connection with stripe 34a. The stripes 34a and 34b may be grounded as indicated in FIG. 6 by any suitable ground wire.

Since the conductive plastic band 62 extends entirely around the connector wall 45 for 360°, the stripes 34a

and 34b need not be aligned with each other for good electrical connection, that is, the tube connector end 44' may be inserted at any angular relationship with respect to the connector 44 and stripes 34a and 34b will be in good electrical connection. In the preferred embodiment, the plastic material of the tube 43, stripe 34a and coating 50 are all based on the same plastic material, in this case, vinyl chloride with the result that the adhesive bonds between the plastic stripe, coating, and the tube are excellent.

The connectors 44 and 46 have walls which are sufficiently thick to permit manual connection of them in sealing engagement with another member without kinking. This is accomplished by controlling the extrudate 29 in a manner to provide the bubbles 30 in FIG. 2 with walls which are thicker than the walls of constant diameter portions 32. The walls of the bubbles become thinner as they approach the portions 32.

While the preferred method of providing a conductive coating on the connector end includes dipping in a solvent solution and then drying to release the solvent, other methods, such as spraying and the like, can be used. Where desired, both end connectors of each tube can be advantageously provided with a conductive plastic coating such as coating 50.

While the tubing 29 is shown severed at locations 41 and 42 to provide tapered connectors 44 and 46, such tubing can be severed at other locations where desired. For example, the tubing may be severed at a portion 32 of constant diameter to provide a connector which does not taper. Such a straight end connector can be inserted in fluid tight relation into a radially outwardly flared connector of suitable size or it can receive, in fluid tight relation, a connector which is tapered radially inwardly and of suitable size.

While the stripe 34a is preferably extruded onto the molten tubing 29 as described and illustrated herein, a suitable conductive stripe or filament may be applied to the tubing after it has been cooled. Also, the tubing may be cut into desired lengths of tubing and the conductive stripe then applied in a suitable manner to each tubing length.

As is well known in the art, the plastic materials used in the tubing, stripe and conductive layer may, of course, include plasticizers that provide a desired flexibility or other materials to provide other desired final characteristics. Also, the tubing may be formed or extruded from rubber and various compositions thereof with the conductive stripe and conductive layer formed from well-known conductive rubber compounds.

In view of the above, it will be seen that the objects of the invention, as well as other advantageous results are obtained. As various changes could be made in the above disclosure without departing from the scope of the invention, it is intended that all matter in the above description and shown in the drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A medical tube comprising a tubular member of plastic material including an integral connector at one end having an interior wall tapering radially outwardly toward the free end thereof for receiving in fluid tight communication another member having electrically conductive means on the exterior thereof, an electrically conductive plastic stripe adhering to and extending generally longitudinally along substantially the entire length of said tubular member for preventing the accumulation of electrostatic charges on the tube, said stripe having a width substantially narrower than that of said tubular member and having the radially outer surface thereof exposed, and a coating of electrically conductive plastic material adhering to said connector and including a coating portion on the exterior wall of said connector covering and in electrical contact with a part of said stripe, a coating portion on the interior wall of said connector extending over a substantial circumferential surface area thereof for electrical contact engagement with the conductive means on the other member when the other member is connected in fluid communication with said connector, and a coating portion on the free end of said connector electrically connecting the coating portion on the interior wall of said connector to the coating portion on the exterior wall of said connector, the thickness of said coating being less than that of the wall of said tubular member.

2. The medical tube of claim 1 wherein said tubular member comprises vinyl chloride.

3. The medical tube of claim 2 wherein said stripe and said coating comprise conductive carbon.

4. The medical tube of claim 1 wherein said tubular member, said stripe, and said coating all include the same type of plastic material.

5. The medical tube of claim 4 wherein said same type of plastic material comprises vinyl chloride.

6. The medical tube of claim 1 wherein the thickness of said coating is less than 0.01 of an inch.

7. The method of making a medical tube with means for preventing the accumulation of electrostatic charges thereon and adapted for connection with another member which has conductive means thereon, comprising the steps of forming a tube of plastic material having a stripe of electrically conductive plastic material having a width substantially narrower than the width of the tube and adhering to and extending along substantially the entire length of the tube with the radial outer surface thereof exposed, and an integral tube connector at one end of the tube with the interior walls thereof tapering radially outwardly toward the free end thereof for receiving said other member in fluid tight frictional engagement, applying a liquid coating comprising an electrically conductive material and a plastic material onto said connector to coat the interior, exterior, and free end walls of said connector with the coating on the exterior of said connector extending over a portion of said stripe and in electrical contact therewith, and solidifying the coating in situ to form a conductive plastic coating adhering to said connector for connecting the conductive means of the other member when it is connected to said connector in electrical connection with said stripe.

8. The method of claim 7 wherein the plastic materials of said tube, stripe, and coating are of the same type.

9. The method of claim 8 wherein said same type of plastic material comprises vinyl chloride.

10. The method of claim 9 wherein said liquid includes a solvent of the type that attacks vinyl chloride.

11. The method of claim 7 wherein said liquid includes a solvent of a type that attacks the plastic materials of said tube, stripe, and coating to bond said coating to said tube and said stripe.

12. The method of claim 11 wherein said step of forming said tube comprises extruding vinyl chloride compound in tube form, and simultaneously extruding said stripe with the extrusion of said tube.

13. The method of claim 7 wherein said step of applying the liquid coating comprises dipping the connector into a quantity of the liquid coating.

* * * * *